Draft Report

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

ADVISORY BOARD ON RADIATION AND WORKER HEALTH

A PRE-EVALUATION OF DCAS-PER-041, DCAS-PER-042, DCAS-PER-043, DCAS-PER-044, AND DCAS-PER-045 FOR A FORMAL AUDIT BY SC&A

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Record of Revisions

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TABLE OF CONTENTS

1.0 INTRODUCTION

When new information becomes available or existing information/data are revised that may increase the dose of previously completed dose reconstructions (DRs), NIOSH is committed to issue a Program Evaluation Report (PER) and rework **all** claims that meet stated selection criteria.

In brief, PERs are an essential part of a quality assurance program inasmuch as they evaluate the effect(s) of newly acquired data on previously completed DRs. This includes a qualitative and quantitative assessment of potential impacts, which may vary from only modest to profound changes that include the compensation of previously denied claims.

Depending on a host of variables that define and characterize a given PER, the need for an independent audit is also variable and for select PERs may not be justified. Salient variables that may be considered in prioritizing whether an audit is necessary include the following:

- The complexity of new information/data that prompted the PER
- Scope and level-of-effort needed to revise dose estimates of affected claims
- The number of revised DRs with POCs less than 50% and the minimum number of DRs required for audit under Subtask 4
- The magnitude of change(s) to revised dose estimates
- The quality and completeness of guidance provided in the PER (and supporting documents) to the dose reconstructor(s) that assure consistent interpretation and compliance with the PER

1.1 PRE-EVALUATION OF DCAS-PER-041: OTIB-0006 REVISION

Revision 4 of ORAUT-OTIB-0006 (*Dose Reconstruction from Occupational Medical X-ray Procedures*) introduced several changes to dose estimates, some of which reduced doses, while others increased doses. Increased doses include the following:

- Doses from LAT lumbar spine x-rays for **all** years for stomach, bone surfaces, liver, gall bladder, spleen, and remainder organs.
- Dose to the **ovaries** from pelvic x-rays up to the end of 1970. (Note: pelvic x-rays were used to monitor workers with potential exposure to fluoride to detect bone changes due to fluorosis.)

A comparison of doses cited in Tables 7-10 and A-8 of Rev. 03 versus Rev. 04 of ORAUT-OTIB-0006 for the above-cited organs show only modest increases, as presented in Table 1 below.

Table 1. Comparison of Organ Doses Cited in Rev. 03 and Rev. 04 of ORAUT-OTIB-0006

Organ	Dose (mrem)		
	OTIB-0006, Rev. 03	OTIB-0006, Rev. 04	
		Pre-1970	Post-1970
Ovary	294	650	—
Stomach	100	117	164
Bone Surface	100	117	164
Liver/Gall Bladder/Spleen	100	117	164
Remainder	100	117	164

Number of Claims Affected. Site Profiles that reference the use of OTIB-0006 include Harshaw (ORAUT-TKBS-0022), Brookhaven National Laboratory (ORAUT-TKBS-0048), Extrusion Plant (ORAUT-TKBS-0056), and Paducah Gaseous Diffusion Plant (ORAUT-TKBS-0019). Although a total of 235 claims met the initial screening criteria, only 3 cases were shown to be potentially impacted by Rev. 04 of OTIB-0006 and none of the reworked doses resulted in probability of causation (POC) values above 50%.

1.2 PRE-EVALUATION OF DCAS-PER-042: LINDE CERAMICS PLANT TBD REVISION

PER-042 addresses changes introduced in the current Rev. 03 of ORAUT-TKBS-0025 and previous revisions, Rev. 02 and Rev. 01. While some changes decreased, other changes increased the dose. With the designation of three Special Exposure Cohort (SEC) classes, some sources of internal exposures were deemed insufficiently accurate for DR and eliminated. Their elimination will, therefore, **reduce** doses.

Potential **increases** in dose include changes to exposure scenarios in utility tunnels and the distribution of internal doses applied to the reconstruction of trade workers.

Number of Claims Affected. Given the number of changes that either increased or decreased estimated dose, nearly all previously completed DRs with POCs less than 50% were potentially affected. However, the potential number of claims requiring reworking was greatly reduced by the three SEC classes that covered the period October 1, 1942, through December 31, 1969.

Based on selection criteria, NIOSH identified 78 claims for a revised DR. Of the 78 reworked DRs, 4 cases exceeded the POC value of 50%; the remaining 74 cases all yielded POC values below 45% and represent the total pool of revised DRs from which a sample may be selected for audit.

1.3 PRE-EVALUATION OF DCAS-PER-043: INTERNAL DOSIMETRY ORGAN, EXTERNAL DOSIMETRY ORGAN, AND IREP MODEL SELECTION BY ICD-9 CODE REVISION

Since November 3, 2003, when Rev. 00 of ORAUT-OTIB-0005 was issued, OTIB-0005 was revised **nine times** ending with Rev. 05 on December 20, 2012. Changes introduced by these revisions involved (1) assignment of different internal and or external organ(s) for select ICD-9

codes, (2) addition of new codes that had previously not been modeled, and (3) addition of new target organs.

Number of Claims Affected. Although several hundred DRs met the initial screening criteria for further evaluation, all but 36 claims were shown **not** to be impacted by any of the revisions introduced in OTIB-0005. Of the 36 claims requiring a rework of estimated doses, 2 claims resulted in revised POC values greater than 50%. Thus, the total number of revised DRs from which a sample set may be selected for audit is 34.

1.4 PRE-EVALUATION OF DCAS-PER-044: METALLURGICAL LABORATORY

The Metallurgical Laboratory in Chicago, Illinois, played a key role in supporting the Manhattan Engineering District in the development of the atomic bomb during World War II. However, no Technical Basis Document (TBD) has been developed that would support the DR for Metallurgical Laboratory claims. Correspondingly, NIOSH concluded that there was insufficient data to estimate internal and external doses for the entire covered period of operation from August 13, 1942, through June 30, 1946. A class of employees was added to the SEC on February 15, 2009.

In addition to the designation of the SEC class, the following changes have been identified that could affect non-presumptive cancer claims:

- Dates of operational and residual period for the Metallurgical Laboratory
- Changes to ORAUT-OTIB-0070, *Dose Reconstruction During Residual Radioactivity Periods at Atomic Weapons Employer Facilities*, that have been referenced in claims not covered by the SEC Class

Number of Claims Affected. A review of previously completed Metallurgical Laboratory claims identified a single claim that had been completed with (1) a POC value of less than 50%, and (2) employment beyond June 30, 1946. A rework of this claim in behalf of PER-044 yielded a POC that remained below 50%. Thus, the total number of claims eligible for audit by SC&A is limited to one.

1.5 PRE-EVALUATION OF DCAS-PER-045: ALIQUIPPA FORGE TBD REVISION

Rev. 01 of Aliquippa Forge TBD (ORAUT-TKBS-0021) was issued April 26, 2012, with revised dates associated with two **residual periods** representing March 1, 1950, through December 31, 1987, and from January 1, 1989, through December 31, 1992. Revisions to these residual periods affect both internal and external dose as a result of changes introduced in Rev. 01of ORAUT-OTIB-0070, which was issued on March 5, 2012.

Number of Claims Affected. Based on workers' employment periods that included the residual period(s) and completion dates of the original DRs, NIOSH identified a total of 21 claims for rework. All 21 reworked claims yielded POC values of less than 45% and represent the pool of claims from which a sample may be audited.

2.0 DISCUSSION AND SUMMARY CONCLUSIONS

SC&A pre-evaluated each of the five PERs and their supporting documents against the five aforementioned criteria. It must be cautioned, however, that our pre-evaluation is based on a limited review of these data and is further compromised by the variability with which a given PER will impact affected DRs that require revision. For example, the impacts of a PER that potentially affect both **internal** and **external** doses by either **raising** or **lowering** doses will vary significantly among impacted DRs and can, therefore, not be assessed as part of this pre-evaluation.

Table 2 provides a semi-quantitative pre-evaluation, which ranks PERs for each of the five criteria as high, medium, or low. Highlighted as part of our assessment, SC&A recommends auditing PER-042, PER-043, and PER-045.

The limited benefit of conducting an audit for PER-041 is principally due to the highly prescriptive/incontrovertible substitution of revised organ dose estimates of medical doses that furthermore involve only limited increases in assigned doses. For PER-044, the absence of a facility site profile and personnel monitoring provide a limited basis for a DR that is further limited to a single claim and a non-presumptive cancer.

Table 2. Pre-evaluation Scoring of PERs

PER ID	Complexity of Revision/Data that Prompted PER	Scope and Level-of-Effort Needed for Revision of Impacted Claims	Minimum DR Sample Size Required for Audit	Potential Magnitude of Changes to Revised Doses	Quality and Completeness of Guidance for Dose Revision
PER-041	Low	Low	Medium	Low	Medium
PER-042	High	High	High	Medium	Low
PER-043	High	High	High	High	Medium
PER-044	Medium	Low	Low	Uncertain	Low
PER-045	Medium	Medium	Medium/High	Medium	Medium

3.0 REFERENCES

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DCAS 2013b. *Metallurgical Laboratory*, Rev. 0, DCAS-PER-044. Division of Compensation Analysis and Support, Cincinnati, Ohio. May 16, 2013.

DCAS 2013c. *Internal Dosimetry Organ, External Dosimetry Organ, and IREP Model Selection by ICD-9 Code Revision*, Rev. 0, DCAS-PER-043. Division of Compensation Analysis and Support, Cincinnati, Ohio. June 7, 2013.

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ORAUT 2012c. *An Exposure Matrix for Linde Ceramics Plant (Inclusing Tonawanda Laboratory)*, Rev. 03, ORAUT-TKBS-0025. Oak Ridge Associated Universities Team, Cincinnati, Ohio. July 26, 2012.

ORAUT 2012d. *Paducah Gaseous Diffusion Plant – Occupational Medical Dose*, Rev. 03, ORAUT-TKBS-0019-3. Oak Ridge Associated Universities Team, Cincinnati, Ohio. August 23, 2012.

ORAUT 2012e. *Internal Dosimetry Organ, External Dosimetry Organ, and IREP Model Selection by ICD-9 Code*, Rev. 5, ORAUT-OTIB-0005. Oak Ridge Associated Universities Team, Cincinnati, Ohio. December 20, 2012.

ORAUT 2013. *Technical Basis Document for the Brookhaven National Laboratory*, ORAUT-TKBS-0048, Rev. 02, Oak Ridge Associated Universities Team, Cincinnati, Ohio. February 7, 2013.