



# Review of One Advisory Board-Selected Case Reworked for the Evaluation of ORAUT-OTIB-0052 Revisions (DCAS-PER-062, Subtask 4)

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# ORAUT-OTIB-0052 revision history

- ◆ Addresses “Parameters to Consider when Processing Claims for Construction Trade Workers”
- ◆ Revision 00 issued August 2006
- ◆ SC&A review of revision 00 July 2007 (16 findings)
- ◆ Revision 00 PC-1 issued January 2007
- ◆ OCAS-PER-014 issued November 2007 to evaluate cases adjudicated before issuance of OTIB-0052
- ◆ Revision 01 issued February 2011
- ◆ SC&A review of revision 01 July 2011 (assess status of 16 findings)
- ◆ SC&A review of OCAS-PER-014 issued March 2012
- ◆ Revision 02 issued July 2014

# DCAS-PER-062, “ORAUT-OTIB-0052”

- ◆ Issued November 2017 to assess changes introduced in revisions 01 and 02 of OTIB-0052
- ◆ OTIB-0052 provides a correction factor that increases external dose if co-exposure data were used for construction trade workers (CTWs)
- ◆ Population of potentially impacted cases included 20 total sites where co-exposure data had been developed
- ◆ Only eight sites had no previous or forthcoming PER

# Cases reevaluated under DCAS-PER-062

- ◆ Total of 1,006 cases reevaluated:
  - 1 case with POC >52%
  - 1 case with POC 45–50%
  - 992 cases with POC <45%
  - 12 cases returned to the U.S. Department of Labor (DOL) prior to issuance of PER-062

# SC&A's review of DCAS-PER-062

- ◆ SC&A's May 2018 review identified two observations
- ◆ Summary of observations:
  - Observation 1: No documentation found that a co-exposure model is being developed or that a PER is forthcoming for Albany Research Center.
  - Observation 2: To ensure that appropriate OTIB-0052 guidance is applied to all cases evaluated under planned PERs for the 20 sites listed in DCAS-PER-062, SC&A should (1) maintain a list of these sites, (2) be informed when the PER is issued, and (3) review the PER to assess whether the selection of reworked cases will adequately capture all potential CTWs.

# DCAS-PER-062 subtask 4 review of one reworked case

- ◆ ABRWH selected the one reworked case with a POC between 45% and 50% for SC&A's review
- ◆ SC&A evaluated the reworked case in December 2021 to determine if external doses were correctly assessed in accordance with DCAS-PER-062

# NIOSH's reworked DR

- ◆ NIOSH's rework of the case:
  - Used applicable DR tools
  - Recalculated all annual doses
  - Re-ran IREP 30 times at 10,000 iterations
- ◆ Resulted in the reworked DR having a combined POC increase of ~19%
- ◆ Revised DR report not sent to DOL because the compensation decision did not change

# Case background

- ◆ Energy employee (EE) worked at Nevada Test Site (NTS) for ~20 years and at one additional site
- ◆ Based the EE's job title, the EE was classified as a CTW
- ◆ EE was periodically monitored for radiation exposure
- ◆ Diagnosed with two qualifying cancers nearly 30 years after employment termination



# Comparison of NIOSH's reworked doses versus original doses

<b>Dose categories</b>	<b>Cancer 1 reworked vs. original dose percentage</b>	<b>Cancer 2 reworked vs. original dose percentage</b>
External	~9% increase	~24% decrease
Occupational medical	No change	No change
Internal	No change	No change
Total	~9% increase	~24% decrease

# External dose components for this case

- ◆ Recorded photon dose
- ◆ Missed photon dose
- ◆ Unmonitored photon dose
- ◆ Unmonitored electron dose

# Original recorded photon dose calculations

- ◆ Based on guidance in NTS occupational external dose TBD, ORAUT-TKBS-0008-6, rev. 01 PC-1:
  - a film badge correction factor of 1.25 was applied
  - an uncertainty factor of 1.3 was applied to the cancer 2 site
  - photon energies were assumed to be 25% 30–250 keV and 75% >250 keV
- ◆ Liver selected as surrogate organ for cancer 2
- ◆ For cancer 2, a DCF value from OCAS-IG-001, rev. 03, was applied for 30–250 keV photons and a claimant-favorable DCF of 1.0 was applied to >250 keV
- ◆ Assigned dose to all cancer sites ~6.000 rem

# Reworked recorded photon dose calculations

- ◆ Based on guidance in NTS occupational external dose TBD, ORAUT-TKBS-0008-6, rev. 03:
  - a film badge correction factor of 1.25 was applied
  - an uncertainty factor of 1.3 was applied to the cancer 2 site
  - photon energies were assumed to be 25% 30–250 keV and 75% >250 keV
- ◆ Liver selected as surrogate organ for cancer 2
- ◆ DCF values selected based on applicable guidance in ORAUT-OTIB-0017, rev. 01, and OCAS-IG-001, rev. 03
- ◆ For cancer 2, DCF values applied using Monte Carlo methods
- ◆ Assigned dose to cancer 1 of ~5.000 rem and cancer 2 of ~4.000 rem

# SC&A's conclusions on recorded photon dose calculations in the reworked DR

- ◆ Confirmed positive recorded doses were only found for 3 years of employment
- ◆ Appropriate photon energies were used
- ◆ Applied TBD-specified dosimeter biases and uncertainties
- ◆ Verified appropriate anterior-posterior geometry exposure to organ DCF values were applied
- ◆ Doses correctly entered in IREP input tables
- ◆ Reworked dose for cancer 2 decreased due to using IG-001 DCF value for >250 keV photons rather than claimant-favorable value of 1.0
- ◆ SC&A had no findings about reworked recorded external dose assignment

# Original missed photon dose calculations

- ◆ Calculated missed dose for 2 years of employment with zero badge readings
- ◆ Calculated missed dose for partial year of employment with no dosimetry records
- ◆ Assumed 13 zero badge exchanges
- ◆ Dose based on one-half the limit of detection of 0.040 rem
- ◆ Applied film badge correction factor of 1.25
- ◆ Photon energies 25% 30–250 keV and 75% >250 keV
- ◆ Applied same DCF values as recorded photon dose
- ◆ Assigned dose to both cancer sites ~0.300 rem

# Reworked missed photon dose calculations

- ◆ Counted 16 missed dose for years of employment with reported zero readings
- ◆ Counted 15 additional missed doses assuming a monthly exchange rate when unmonitored dose was assigned
- ◆ Dose based on one-half the limit of detection of 0.040 rem
- ◆ Applied film badge correction factor of 1.25
- ◆ Photon energies 100% 30–250 keV for cancer 1
- ◆ Photon energies 25% 30–250 keV and 75% >250 keV for cancer 2
- ◆ DCF values selected from applicable guidance documents
- ◆ Assigned dose to cancer 1 ~0.700 rem and cancer 2 ~0.500 rem

# SC&A's conclusions on missed photon dose calculations in the reworked DR

- ◆ Confirmed 16 badge exchanges reported a dose of zero
- ◆ TBD states that before 1957 missed dose should be assigned for each month employed during the years unmonitored dose evaluated
- ◆ Applied TBD-specified dosimeter bias
- ◆ Verified appropriate anterior-posterior geometry exposure-to-organ DCF values were applied
- ◆ Doses correctly entered in IREP input tables
- ◆ Reworked doses increased due to counting 31 missed zero exchanges rather than 13 missed zero in original
- ◆ SC&A had no findings about reworked missed external dose assignment



# Original unmonitored photon dose calculations

- ◆ Unmonitored dose assessed for one year of employment
- ◆ 50th percentile co-exposure dose assigned
- ◆ Applied film badge correction factor of 1.25
- ◆ Applied 1.3 uncertainty to cancer 2
- ◆ Photon energies 25% 30-250 keV and 75% >250 keV
- ◆ Applied same DCF values as recorded photon dose
- ◆ Modest dose assigned to both cancer sites

# Reworked unmonitored photon dose calculations

- ◆ EE not monitored before universal badging; therefore, unmonitored dose assigned for prior years of employment
- ◆ 50th percentile co-exposure dose used
- ◆ Applied film badge correction factor of 1.25
- ◆ Applied 1.3 uncertainty to cancer 2
- ◆ Applied CTW correction factor of 1.4
- ◆ Photon energies 25% 30–250 keV and 75% >250 keV for cancer 2
- ◆ DCF values based on applicable guidance
- ◆ Assigned dose to both cancer sites ~0.100 rem

# SC&A's conclusions on unmonitored photon dose calculations in the reworked DR

- ◆ TBD guidance followed for:
  - Assigning dose during appropriate years of unmonitored employment
  - Use of 50th percentile co-exposure data
- ◆ Applied TBD-specified dosimeter bias and uncertainty
- ◆ Applied appropriate CTW correction factor
- ◆ Verified appropriate anterior-posterior geometry exposure-to-organ DCF values were applied
- ◆ Doses correctly entered in IREP input tables
- ◆ Reworked doses increased due to number of years unmonitored dose assigned
- ◆ SC&A had no findings about reworked unmonitored photon dose assignment

# Original unmonitored electron dose calculations

- ◆ Nonpenetrating dose not recorded at NTS before 1966
- ◆ DR calculated unmonitored electron doses for years when the EE was monitored for photon dose
- ◆ Dose based on photon-to-electron ratio of 1.0
- ◆ Considering cancer location, attenuation factor of 0.855 was applied based on guidance in ORAUT-OTIB-0017, rev. 01
- ◆ Assigned total dose of ~4.000 rem
- ◆ Annual doses entered in IREP as >15 keV as constant values

# Reworked unmonitored electron dose calculations

- ◆ DR calculated unmonitored electron doses for years:
  - prior to 1966 when the EE was monitored for photon dose
  - when photon co-exposure dose was assigned
- ◆ Dose based on photon-to-electron ratio of 1.04 to 1.0
- ◆ Considering cancer location, attenuation factor of 0.855 was applied based on guidance in ORAUT-OTIB-0017, rev. 01
- ◆ Assigned total dose of ~4.500 rem
- ◆ Annual doses entered in IREP as >15 keV as lognormal values with GSD of 2.14

# SC&A's conclusions on unmonitored electron dose calculations in the reworked DR

- ◆ TBD guidance followed for assigning electron dose:
  - during years of employment prior to 1966
  - when photon co-exposure dose was assigned
- ◆ Applied TBD-specified photon-to-electron ratio
- ◆ Attenuation factor justified and appropriate factor applied
- ◆ Doses correctly entered in IREP input tables
- ◆ Reworked doses increased due to number of years unmonitored dose assigned
- ◆ SC&A had no findings about reworked unmonitored electron dose assignment

# Summary comparison of original and reworked external doses

External dose category	Cancer 1 rework vs. original	Cancer 2 rework vs. original	Comments
Recorded photon	0.4% decrease	32% decrease	Cancer 2 rework decreased due to using IG-001 DCFs rather than claimant favorable
Missed photon	150% increase	95% increase	Rework increase due to counting zeros for missed and unmonitored (31) vs. original counting missed only (13)
Unmonitored photon	717% increase	474% increase	Rework increase due to assessing unmonitored for all years before universal badging rather than 1 year
Unmonitored electron	7% increase	Not applicable	Rework increase due to assessing dose prior to 1966, plus for years when photon co-exposure dose was assigned



# Questions?