Review of One Advisory Board-Selected Case Reworked for the Evaluation of Norton Dose Reconstruction Template Revisions (DCAS-PER-059, Subtask 4)

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Summary of Norton Facility operational history

- Worked with thorium and uranium
- Operational period 1945 through 1957
- Residual radiation period 1958 through October 2009
- No technical basis documents
- Dose reconstruction (DR) methodology incorporated into a template

DCAS-PER-059, "Norton Company"

- Issued April 2015 due to revisions to the Norton Company template
- Revision included:
  - Modified template to include second SEC class corresponding to portion of residual period (January 1, 1958, to October 10, 1962)
  - Incorporated updated ORAUT-OTIB-0070, revision 01, guidance, which adopted a lower depletion rate of 0.067% per day for residual contamination starting October 10, 1962, through 2009

SC&A's review of DCAS-PER-059

- SC&A's May 2017 review identified three findings
- Summary of findings:
  - **Finding 1:** Insufficient information in template to identify critical data and parameters needed to duplicate and/or confirm model for estimating external deep and shallow doses starting with the residual period of 1962
  - **Finding 2:** Cited references for "air dust" survey data identifies five of nine references containing "operational" thoria and uranium data with dates starting in 1958 and continuing through 1964
  - **Finding 3:** 1962–1963 air concentration and daily intake values for uranium derived by SC&A are a factor of 2 lower than values listed in template
- All findings were discussed and closed during Subcommittee for Procedure Reviews meeting October 31, 2018

DCAS-PER-059 subtask 4 review of one reworked case

- ABRWH selected one reworked case for SC&A's review in April 2021, based on the following criteria:
  - assignment of external dose during the residual period
  - assignment of internal dose during the residual period
- SC&A reviewed the reworked case in December 2021 to determine if external and internal doses were correctly assessed in accordance with DCAS-PER-059

NIOSH's reworked DR

- NIOSH's rework of the case:
  - Used applicable DR tools
  - Recalculated all annual doses
  - Re-ran IREP
- Revised DR report not sent to the U.S. Department of Labor because the compensation decision did not change

Case background

- Energy employee (EE) worked at Norton Company for multiple brief periods during the residual period
- EE was not monitored for radiation exposure
- Diagnosed with qualifying cancer about 25 years after employment termination

Comparison of NIOSH's reworked doses versus original doses

- Original DR calculated external and internal doses of <0.001 rem
- Reworked DR calculated modest external and internal doses

Original external dose calculations

- Used guidance in template available in 2010 for external dose during the residual period
- No prorating for partial years of employment
- Applied dose conversion factor (DCF) of 1.000
- Derived dose of <0.001 rem

Reworked external dose calculations

- Used residual period external exposure values from updated 2011 template
- No prorating for partial years of employment.
- Applied exposure DCF of 1.44 for the thyroid as the surrogate organ
- Assigned dose of ~0.030 rem

SC&A's conclusions on external dose

- Appropriate dose values selected from revised template
- Correct surrogate organ was selected, based on ORAUT-OTIB-0005, revision 05
- Appropriate DCF value was applied
- No partial-year prorating applied, as an efficiency and claimant-favorable measure
- Review confirmed doses were accurately entered in IREP
- As expected, reworked DR external dose increased from that calculated in the original DR
- SC&A had no findings about reworked external dose assignment

Original internal dose calculations

- Inhalation and ingestion intakes from DR methodology template
- Used CADW to compare doses from U-234 absorption types M and S with Th-232 absorption types M and S, with Th-232 type M resulting in the highest dose
- Calculated dose of <0.001 rem

Reworked internal dose calculations

- Used inhalation and ingestion exposure values from updated template
- Assumed isotopic mix of U-234, Th-232, Th-228, Ac-228, Ra-228, Ra-224, and Rn-220
- Compared solubility types M and S, with type M resulting in more claimant-favorable dose
- Using CADW, calculated dose of <0.020 rem

SC&A's conclusions on internal dose

- Reviewed NIOSH's CADW files for the reworked DR and confirmed that correct intake values were used, based on data in updated template
- SC&A verified:
  - Type M solubility resulted in the higher dose
  - Dose data appropriately entered in IREP table
  - Doses were assessed to the date of cancer diagnoses
- SC&A had no findings about the assessment of internal dose in the reworked case

Questions?