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Subcontractor bioassay evaluation by Dose Reconstruction Best Estimate Methodology

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Introduction

Uranium urinalysis bioassay data are available for subcontractor workers in the SRDB that are not included in the records supplied by the DOE in response to claim exposure data requests. However, this data source may not be complete and there is reason to believe that other bioassay data could be missing. When bioassay data are not available, the workers are often assigned coworker intakes to assess internal dose. It has been requested that the data from the SRDB be evaluated to determine whether the coworker study 95th percentile intakes would be bounding for these workers. Therefore, a comparison was made of the internal dose that would be assigned based on the actual bioassay data in a best estimate dose reconstruction of the fitted intakes for these workers and that which would be assigned if the coworker study 95th percentile intakes were used. For this review, 10 workers in 1969 who all worked for one of two subcontractor employers, none of whom are claimants, were selected along with 4 workers who are claimants and had the highest bioassay results in the SRDB records for individuals who were also claimants. For the 10 workers in 1969, no information is available regarding their work start/stop dates, and dates of diagnosis for cancers are not available or any relevant information pertaining to whether any of the 12 have developed cancer.

In order to simplify the evaluation and compensate for the lack of information for some of the individuals, specific organ doses will not be calculated. For the same solubility type, the dose received by any particular organ will generally scale directly with the magnitude of the integrated intake, especially for intakes received in a relatively small period of time. Therefore, the comparison between the best estimate internal assessment and the use of the coworker study intakes will be performed on the basis of integrated intakes rather than doses. Missed dose intakes are not included in this evaluation as it is not appropriate to compare missed dose to coworker dose.

Generic Information for 1969 workers

All the workers were employed by I Deutsch & Sons or M&M metals, one by both. It is assumed that all these workers were onsite for the same project (presumed to be scrap metal recovery) and thus have the same beginning and end of employment. The first bioassay for any of the workers is on 7/9/69 and the last is on 10/13/69. Therefore, it is assumed that the first day of employment is July 1, 1969 and the last day is October 31, 1969 (123 days) for all workers.

The Fernald Internal TBD (ORAUT-TKBS-0017-5, Rev 0) states to assume a 2% enrichment for 1969 uranium sample results (1.616.pCi/ug). The MDA for this time period is assumed to be 14 ug/L, or 31.67 pCi/d. The bioassay data seem to indicate that the exposure was to Type F or M uranium. Type S is a poor fit to many of the positive measurements. However, all three solubility types have been assumed

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to be possible. Data also indicate that acute intakes for several workers occurred on July 17 and/or August 26. These acute intake dates were used for all the workers whose bioassay data contain positive results shortly after these dates. This information was used in this manner in lieu of an incident writeup that would normally be expected to be included in the DOE-supplied claim information.

In addition, the constituents associated with recycled uranium would normally be assigned (plutonium-239, neptunium-237, and technetium-99) to any uranium intakes in 1969. However, since the magnitude and dose from these RU constituents scale directly with the magnitude of the uranium intake, no further discussion of these constituents is made in this comparison.

Coworker intakes at the 95th percentile are 159 pCi/d for Type F, 642 pCi/d for Type M, and 7869 pCi/d for Type S. If assigned for the entire employment period, these rates correspond to total intakes of 19,557 pCi for Type F, 78,966 pCi for Type M, and 967,887 pCi for Type S.

1969 worker [Worker 2]

[Worker 2] had four urinalysis results - two positive measurements beginning August 27 followed by two <MDA in October. The data are indicative of an acute intake occurring on August 26 as discussed above. One acute intake was assigned.

Acute Intake 08/26/1969

F fitted – 117910 pCi

M fitted – 408170 pCi

S fitted – 12002000 pCi

1969 worker [Worker 3]

[Worker 3] had six total urinalysis results - two positive measurements, one in July, one in August. Both are assumed to be the day before as discussed above. These dates provide the best fit to the bioassay data. The last two measurements are < MDA in October as are two results in July. Two acute intakes were assigned.

Acute Intakes 07/17/1969, 08/26/1969

F fitted – 234, 5285 pCi

M fitted – 1849, 414767 pCi

S fitted – 60977, 1367700 pCi

1969 worker [Worker 5]

[Worker 5] had 7 urinalysis results - 6 positive and one <MDA. Fitted dose was assigned for acute intakes on July 17, July 28, and August 26.

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Acute Intakes 07/17/1969, 07/28/1969, 08/26/1969

F fitted – 1361, 628, 16146 pCi

M fitted – 10871, 6072, 122910 pCi

S fitted – 358920, 462490, 4008200 pCi

1969 worker [Worker 6]

[Worker 6] had 2 urinalysis results, both were positive in August, indicative of an August 26 acute intake. This acute intake was assigned.

Acute Intake 08/26/1969

F fitted – 14830 pCi

M fitted – 116020 pCi

S fitted – 3835000 pCi

1969 worker [Worker 7]

[Worker 7] had seven total urinalysis results - 4 positive and the two largest were indicative of the July 17 and August 26 acute intakes. These acute intakes were assigned.

Acute Intakes 07/17/1969, 08/26/1969

F fitted –1990, 3014 pCi

M fitted –16607, 25281 pCi

S fitted –550160, 831810 pCi

1969 worker [Worker 8]

[Worker 8] had seven total urinalysis results - 6 of these were positive and the last bioassay was <MDA. The bioassay were indicative of July 17 and August 26 acute intakes and another acute intake on July 24 to provide the best fit to the bioassay data. These acute intakes were assigned.

Acute Intakes 07/17/1969, 07/24/1969, 08/26/1969

F fitted –598, 576, 2777 pCi

M fitted –4886, 4662, 23777 pCi

S fitted –161090, 153910, 781870 pCi

1969 worker [Worker 10]

[Worker 10] had two urinalysis results, one positive after the July 17 acute intake and a second <MDA measurement. This acute intake was assigned.

Acute Intake 07/17/1969

F fitted –1473 pCi

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M fitted –11617 pCi

S fitted –383170 pCi

1969 worker [Worker 11]

[Worker 11] had four total urinalysis results - 3 positive and one <MDA. Even though the bioassay dates are different from that for most of the workers, it was assumed he was involved in the same incidents and thus had the same acute intake dates. These acute intakes were assigned.

Acute Intake 07/17/1969, 08/26/1969

F fitted –12913, 17100 pCi

M fitted –2291900, 2525000 pCi

S fitted –2057000, 2601000 pCi

1969 worker [Worker 12]

[Worker 12] had seven total urinalysis results - 6 positive bioassay measurements and one <MDA. It appears he was involved in the July 17 and August 26 incidents. These acute intakes were assigned.

Acute Intakes 07/17/1969, 08/26/1969

F fitted –3852, 5930 pCi

M fitted –33428, 50065 pCi

S fitted –1101300, 1646200 pCi

Evaluation for 4 claimant subcontractor workers with the highest bioassay results.

The 4 claimant subcontractors workers with the highest bioassay results were also evaluated. These evaluations benefit from the additional information available in the claimant's case file in the form of the DOL and DOE records, especially employment dates, and the information available in the CATI. The next five claims were evaluated taking advantage of this additional information. Otherwise, the evaluations were performed in a similar manner as those above.

[Worker 13]

[Worker 13] was employed from **[redact]**, 1981 through **[redact]**, 1981 and **[redact]**, 1984 through **[redact]**, 1984. He has 4 total urinalysis results in July/August, 1981, all of which were positive and appear to be the result of an acute intake. The best fit to the data was provided by an acute intake which occurred on July 28, 1981. This intake was compared to a coworker intake assigned for the 1981 employment period.

Acute Intake 7/28/81

F fitted – 6525 pCi

M fitted – 40102 pCi

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S fitted – 7809940 pCi

[Worker 14]

[Worker 14] was employed from **[redact]**, 1984 through **[redact]**, 1984, **[redact]** through **[redact]**, 1986, and **[redact]** through **[redact]**, 1987. He has 6 total urinalysis results in 1984. A 7th result in 1950 for a **[redact]** may be for a different person and was not considered. The best fit to the data was provided by acute intakes on July 2 and July 28, 1984. This second intake date was the midpoint between two bioassay measurements. These intakes were compared to a coworker intake assigned for the 1984 employment period.

Acute intakes 7/2/84, 7/28/84

F fitted – 3296, 9536 pCi

M fitted – 25741, 49047 pCi

S fitted – 849310, 1649500 pCi

[Worker 15]

[Worker 15] was employed from **[redact]**, 1969 through **[redact]**, 1974, **[redact]**, 1980, and **[redact]**, 1981. There are three total urinalysis results in 1971. It is assumed an intake occurred on August 11, 1971, the midpoint between the first positive measurement and the preceding negative measurement. These intakes were compared to a coworker intake assigned for the 1969 through 1973 employment period.

Acute intake 8/11/71

F fitted – 41963 pCi

M fitted – 201750 pCi

S fitted – 6861800 pCi

[Worker 16]

[Worker 16] was employed from **[redact]** 1951 through **[redact]** 1954 and **[redact]**, 1986 through **[redact]**, 1987. He has 8 urinalysis results not in the DOE records, 1 in 1950 and 7 in 1984. He has 27 results in 1986-87 that are in the DOE records. All the results except the 1986/87 results are outside the DOL-verified employment, however, the CATI indicates that he worked for **[redact]** from July through September, 1984, which is when the 1984 urinalysis results were obtained. The 1984 and 1986/87 results were evaluated. The positive results were indicative of a chronic intake for the entire 1984 employment period, and acute intakes on August 25, 1986, and September 10, 1986. These intakes were compared to coworker intakes assigned for the two employment periods with bioassay data.

Intakes 7/1/84 – 9/30/84, 8/25/86, 9/10/86

F fitted –237 pCi/d, 762 pCi, 10056 pCi

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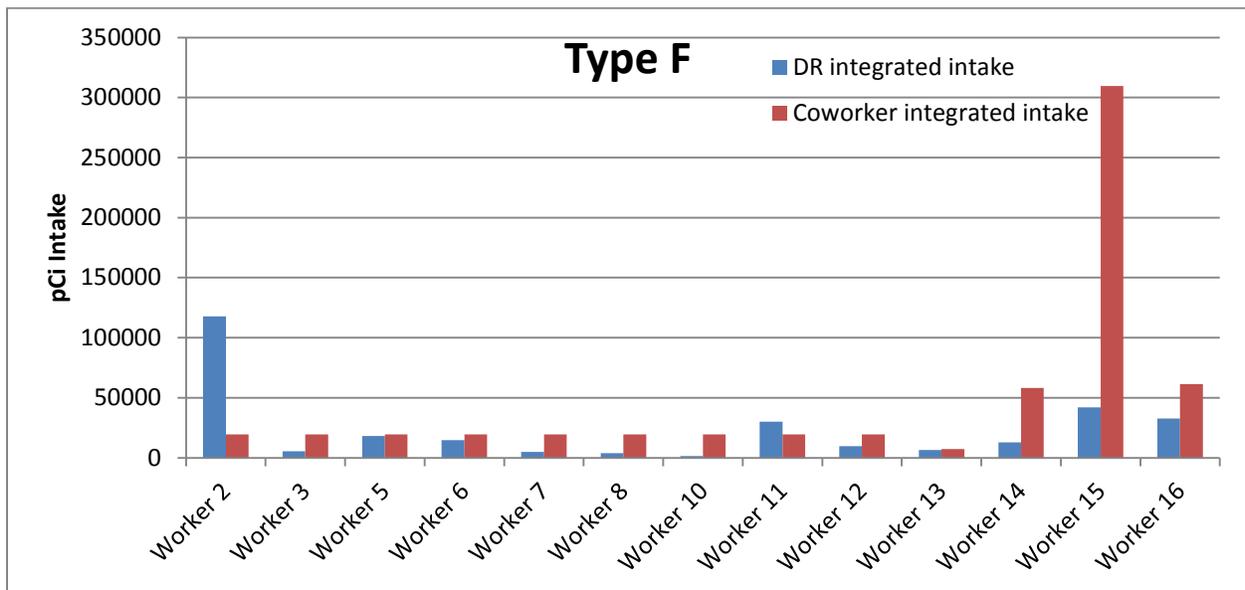
M fitted –1592 pCi/d, 7031 pCi, 54375 pCi

S fitted –52820 pCi/d, 368540 pCi, 1117200 pCi

Conclusions

For each subcontractor, the fitted integrated intakes were compared to the intakes that would have been assigned if each subcontractor had instead been assigned the 95th percentile coworker intake in the charts below. The red bars represent the integrated coworker intake and the blue bars represent the intake based on the best estimate assessment for each subcontractor.

The coworker integrated intakes are similar to or exceed the best estimate calculated intakes for type F and M material for most workers. For Type S material, the best estimate calculated intakes exceed the coworker integrated intakes for most workers.



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