

RE: R01 CCR515748-02-01

Radon and Cigarette Smoking Assessment in Fernald Workers

Final Report: October 17, 2002

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Completed activities contained in the original scope of work:

- Obtained IRB initial approval from UC and DOE IRB's; yearly re-approval from UC IRB
- In search for any historical radon monitoring data, reviewed documents from Federal Records Center in Atlanta and documents from the Fernald records center on Crescentville Road.
- Created database of all available historical radon monitoring data, including hourly radon measurements taken at the K-65 silos and simultaneously at two or more locations. We conducted a time series analysis of these data to test for relationships between radon measured at the silos and various locations throughout the site to examine for correlation of site readings as a function of distance and direction from the silos.
- Via mailed questionnaires, collected detailed occupational histories from living members of Fernald cohort and created electronic file of all occupational history data
- Identified location points within the site for calculation of exposure estimates, based on our knowledge of the location of workers, meteorological data, and dispersion patterns of radon from the K-65 silos
- Consultant George Killough has modified the original Fernald Dosimetry Reconstruction Project model to estimate yearly point specific radon working level estimates for the area within the plant site. This model was originally constructed to estimate exposures to community residents. We did additional analyses to estimate the diurnal variation in exposure, significant at the site, as well as decreases with emissions with the capping of the K-65 silos. For all specified locations, we have calculated yearly night and day exposure estimates.
- Used historical documents and occupational history questionnaire data to develop models for assigning work location to each worker for each calendar year based on information in the work history: department (and/or "Plant"), job title or job code, either singly or in combination
- Assigned each worker in the cohort a work location for each calendar year based on information in the NIOSH supplied work history file
- Analyzed occupational history questionnaire data to determine patterns of shift assignment of workers in each plant or department or in different job titles.

Completed activities not in original scope of work: After we received funding for this project, in collaboration with NIOSH, we jointly decided to add a component to the scope of the work. New technology for estimation of cumulative radon exposure had become available, and employing this new technology would allow us to assess the relative amounts of radon at different locations at the site, and possibly to perform some validation of the calculated estimates. Therefore we first conducted a pilot study of using the CR-39 dosimeters to assay surface concentration of ²¹⁰Polonium on glass, and in November, 2000 placed the dosimeters for the full study. Assays of the dosimeters were

conducted by Dr. Peter Fewes at the HH Wills Physics Laboratory in the UK. Results were received in May, 2001 and indicated an area of high radon exposure around Plant 2/3, probably originating primarily from ore stored in the Q-11 silos, but also possibly from the hot raffinate by product of the chemical separation that occurred in this area. We conducted additional sampling in this area in Fall, 2001 and results were received from Dr. Fewes on January 21, 2002. We have conducted additional document searches and met with workers several times to develop a better understanding of this local source of radon. We have used these findings to create a model to calculate location specific yearly estimates of radon from this secondary source. We now need to apply the final model to our worker specific data to calculate the combined cumulative radon exposure from both (K-65 and Plant 2/3 area) sources.

Work yet to be completed:

- Develop method to assign probability of having worked on the night shift for workers in different classifications
- Use location assignment, probability of working the night shift and yearly radon exposure estimates from K-65 and Plant 2/3 area, assign cumulative radon exposure estimate to each worker in the cohort

We anticipate that this work will be completed by December 31, 2002.

Presentations and Publications:

Dr. Richard Hornung presented the methods used for the ²¹⁰Polonium assay at a scientific conference in Gothenburg, Sweden: X2001-Exposure Assessment in Epidemiology and Practice, in June 2001. His presentation was entitled "Exposure Assessment Strategies and Validations for Estimation of Radon Exposure Among Nuclear Workers."

Dr. Susan Pinney presented the occupational history data collection techniques at the NIOSH Workshop on Best Practices in Workplace Surveillance, Cincinnati, Ohio, November 7-9, 2001. Her presentation was entitled "Modular Questionnaires and Visual Recall Prompts for Occupational History Data Collection."

As part of this funded research, detailed smoking history data were collected on living members of the Fernald cohort. In addition, questionnaires were completed by 442 surrogates of deceased workers, and for 68 of this group, validated with previously collected self-reported smoking history data. A manuscript reporting the findings of this work "Retrospective Smoking History Data Collection for Deceased Workers: Completeness and Accuracy of Surrogate Reports" recently has been accepted for publication by the Journal of Occupational and Environmental Medicine.

Woo JG and Pinney SM. Retrospective Smoking History Data Collection for Deceased Workers: Completeness and Accuracy of Surrogate Reports. JOEM, in press, December, 2002.