

Progress Report for Project 2.2.

Title of Project: Estimation of the Risk of Stochastic (Cancer) Effects of Occupational Radiation Exposure. Project 2.2.

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Period covered in this Report: October 1, 1998 through February 28, 1999

I. Summary of Work:

The overall objective of this long-term project is to develop data on workers at the Mayak facility in the Chelyabinsk Region of Russia to obtain cancer risk estimates based on protracted occupational radiation exposure, both from external gamma-radiation and from internal alpha-radiation from plutonium. The project includes the following tasks: improvement of the computer database (Task 1), updating vital status data (Task 2), expanding the number of workers with low doses or no occupational dose (Task 3), and conducting dose-response analyses to evaluate risks of lung, liver and bone cancer resulting from plutonium exposure (Task 4). During this reporting period, Task 1 has been completed, and work on updating mortality (Task 2) is ongoing. Under Task 3, vital status data has been obtained for 248 mechanical repair plant workers (145 of them were hired in 1948 - 1972), and dosimetry has been checked for 881 mechanical repair plant workers. In addition, work to add water treatment plant workers has been conducted; currently there are 2187 such workers. Under Task 4, analyses of data on bone tumors in Mayak workers have been conducted, and a paper on this subject is under preparation.

II. Milestones and Deliverables Accomplished during the Reporting Period.

Milestone 1 (Task 3). Expansion of the cohort to increase the number of workers with little or no occupational radiation exposure.

Work continues to add workers hired in the period of greatest interest (1948-72) but with lower doses than those employed in the main plants, and includes the addition of workers in the mechanical repair (MR) and water preparation (WP) plants. Although some of these workers were also employed in the main plants, data for the period of employment in the MR and WP plants, including dosimetry data, is being obtained. Those workers with higher doses can later be excluded or assigned to appropriate dose categories depending on the purpose of the analysis. It is expected that this effort will add about 1500 MR workers and 1300 WP workers who were not previously in the registry. In addition, dosimetry data for the period of employment in these plants is being added for workers who were later employed in the main plants and are already included in the registry.

Exposure information was checked for 881 (of 2003) MR workers. Of those 881, 403 (45.7%) are registered (i.e. have paper cards as a primary source of exposure information) in the Radiation Safety Department, but weren't monitored for external doses. This means that during

their employment at MR plant, they worked at the plant's departments, where it was not necessary to provide individual external exposure monitoring. An additional 116 workers (13.2%) were monitored during employment at the MR plant (most of them were overhaul team workers), and 362 (41.1%) were monitored during employment at the MR plant and at other Mayak plants. The exposure information for the remainder of the MR cohort will be checked by the end of March.

Currently there are 2187 WP workers after removing of 56 duplicates. Of those 2187, 1328 (according to the plant's personnel department information) were employed at the WP plant only. Vital status is known for 1499 (of 2187) workers (68.5%, 54 - 75% in different time periods). 859 workers were employed at the WP and other plants, and vital status is currently known for 662 workers (77.1%). We plan to check occupational history information for these workers up to their date of discharge from Mayak and also to check their external exposure history information. After dosimetry information and occupational history checks, we will be able to form a cohort of WP plant workers more precisely.

Tables 1 and 2 provide information on the current status of MR and WP workers. It should be noted that checking for vital status is not yet complete, and should eventually be more complete than reported in these tables.

Table 1. Number of mechanical repair (MR) plant workers by year of hire and other characteristics.

	<u>Year of hire</u>						<u>All years</u>
	<u>48-53</u>	<u>54-58</u>	<u>59-63</u>	<u>64-72</u>	<u>48-72</u>	<u>1972+</u>	
Worked at MR plant only	290	263	232	402	1191	576	1763
Worked at MR plant in <u>overhaul teams</u>	<u>7</u>	<u>25</u>	<u>45</u>	<u>162</u>	<u>239</u>	<u>105</u>	<u>344</u>
Total	297	288	277	564	1430	681	2107
Vital status known	125 42%	136 47%	131 47%	400 71%	792 55%	576 84%	1368 64%
Worked at MR plant and other <u>plants*</u>	<u>233</u>	<u>104</u>	<u>63</u>	<u>171</u>	<u>573</u>	<u>126</u>	<u>697</u>
Total	530	392	340	735	2003	807	2804
Vital status known	281 53%	213 54%	180 53%	554 75%	1228 61%	691 85%	1919 68%

*Many of these workers worked at the main plants. and, for most of them, vital status was already available.

Table 2. Number of Water Preparation (WP) plant workers by year of hire and other characteristics.

	Year of hire				
	<u>48-53</u>	<u>54-58</u>	<u>59-63</u>	<u>64-72</u>	<u>48-72</u>
Worked at WP plant only	428	134	321	445	1328
Vital status known	249 58%	72 54%	183 57%	333 75%	837 63%
Worked at WP plant and other plants*	<u>548</u>	<u>113</u>	<u>80</u>	<u>118</u>	<u>859</u>
Vital status Known	402 73%	96 85%	61 76%	103 87%	662 77%
Total	976	247	401	563	2187

*Many of these workers worked at the main plants, and, for most of them, vital status was already available.

Milestone 2 (Task 1). Computerization of occupational histories by time period and plant of employment.

At the present time, the computer database is organized so that workers are assigned to one of three registries according to the "most dangerous" plant they worked in. During this reporting period, data on which of the three plants workers were employed in during any given time period were computerized. This information will allow more appropriate treatment of plant of employment in dose-response analyses.

Milestone 3 (Task 4). Paper on malignant bone tumors in Mayak workers.

Initial analyses of data on malignant bone tumors in Mayak workers have been conducted. These include comparisons with available bone cancer mortality rates for the Russian population. However, because these rates are available only for the most recent time period, and because they included the ICD code 171 (in addition to the ICD 170 code for bone cancer), comparisons with external rates from other sources have also been made. In addition, we conducted internal comparisons by plant, by level of external dose, by whether internal intakes of plutonium were reported, and by the estimated body burden. Because plutonium monitoring data and bone doses are not yet available for many workers, this paper will be primarily descriptive, and will not attempt to estimate risk per unit of dose. Draft material for a paper describing the bone tumors that have occurred in Mayak workers and the results of analyses that have been conducted is being prepared.

Other work (Tasks 1 and 2).

Previous progress reports described several logical checks that have been conducted, and also briefly described the results of checking source records for all workers currently included in the registry. During the current reporting period, documentation that describes the structure of the database, including a description of variables and codes has been prepared. The documentation also includes information on edits that were performed, the specific workers involved, and the changes that were made as a result of these edits. A system is being developed that will allow tracking of all changes in the registry and make it possible to recover changes at any time.

Work to obtain additional vital status information is continuing in a routine way, and includes efforts to obtain vital status for workers in the mechanical repair and water treatment plants, noted under Task

III. Other Relevant Information, Including Relevant Trip Reports, Obstacles to Completion of Work Outlined in Work Proposal; unexpected Costs: etc.

None.

IV. Publications and Preprints

None.