

Quarterly Report

Office of International Health Programs (EH-63), Department of Energy

Title of Project: Dosimetric Support of the Ukrainian-American Eye-Cataract Study

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Period covered by this report: 15 January – 15 April 2001

I. Summary of Work

The criterion used for selection of candidates for follow-up was the absence of evidence of intentionally falsified dose values. Note that this does not mean that all doses are of comparable and sufficiently high precision. The uncertainties of dose assessments were not incorporated into the study previously. In addition, no beta radiation doses to eye lens were available from the dosimetric monitoring files. Therefore, the tasks of the on-going work have two goals.

They are to:

1. retrospectively evaluate the uncertainties of the dose records, and
2. develop an approach to assess lens doses of beta radiation.

II. Milestones and Deliverables Accomplished during the Reporting Period

The one-year proposal comprised the following milestones:

Milestone 1. Verification of previously acquired dose records.

Implementation of this task was postponed until RADRUE was adopted. It is a new version of interview-based analytical dose reconstruction technique. RADRUE will be available for implementation after mid July. It is intended to perform interviews on a random sample of cohort members and compare official and RADRUE doses in conjunction with consideration of all possible discrepancies, as described in the Annual Work Proposal.

Milestone 2. Refinement of dose records provided by ADR.

This work was initiated in January 2001 by retrieving personal files from the archives of the ChNPP and initiating the reevaluation of the dose estimates. Unfortunately, this work was interrupted in February by the death of Mr. Victor Glebov, an expert-dosimetrist. A replacement for Mr. Glebov was found in March and after appropriate acclimation will assume this task. Dose reevaluation is planned to resume in June 2001.

Milestone 3. *Collection of tooth samples for EPR dosimetry.*

With respect to the need for increased number of teeth, the tooth acquisition effort was both intensified and extended. Two new oblasts were engaged into the tooth acquisition network. Totally, 289 teeth were collected during the 1st quarter of 2001. However, with respect to a high exclusion ratio (only low percentage of collected teeth are good for determination of reference doses, and the overlap with the SCR file is limited) we still need to intensify tooth acquisition. This is particularly true in the Dnipropetrovsk and Kharkiv oblasts, where the collection rate has been lower than expected. Our conclusion is that to improve the situation, changes in the local staff, both central (Ministry of Health) and local levels are necessary and are currently underway.

Milestone 4. *Retrospective evaluation of uncertainties associated with dose records.*

During the first quarter, our work focused on selecting appropriate subjects and sample preparation. In total, teeth from 104 subjects were selected, and to date, 21 EPR doses were reconstructed. Inclusion of the samples is organized in an "on-line" mode, i.e. immediately upon the transfer of a group of new specimens to Kiev and subsequent linkage with the SCR file, the appropriate samples are being forwarded for analyses. Our initial efforts thus far have revealed that the primary bottleneck resides in obtaining sufficient numbers of appropriate teeth. The solution is described above in Milestone 3.

Milestone 5. *Evaluation of beta doses.*

The necessary infrastructure and skills for calculating beta doses have been established. This effort involves Monte Carlo code MCNP, appropriate mathematical phantoms and software to integrate the results of the calculations. Some benchmark calculations were performed in order to compare the performance of MCNP calculations against analytical calculations using Loevinger-type functions for estimating beta doses to lenses.

A special questionnaire was developed is being printed. It is intended to be delivered to ophthalmologists who will fill them out during the course of the ocular examinations. Those subjects who have already been examined in 2001, will receive the questionnaires by post.

Milestone 6. *Integration of individual dose estimates.*

Although the final integration of the dosimetric databases is scheduled for the 4th quarter of 2001, we keep daily contact with the epidemiological branch of the study at each stage of data acquisition. Lists of Liquidators ophthalmologically examined, are being forwarded to the dosimetric branch of the study. In turn dosimetry is provided to the epidemiologists who have received lists including 3307 subjects with the best quality dosimetry for inclusion into the nested case-control study.