

Progress Report

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

Title of Project: Assembling the Cohort for Ukrainian-American Eye-Cataract Study

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Period covered by this report: 1 October 1998 – 31 March 1999

I. Summary of Work

The goal of the project is to select the cohort for the ophthalmic examinations within the scope of the Ukrainian-American Eye Cataract Study. The plan includes the selection of potential members of the studied cohort (based on dosimetric criteria), as well as contacting the selected Liquidators and inviting them to participate in the ophthalmic follow-up. It is planned that the work will be accomplished over a two-year period. During the first 12 months of work, 6499 candidates for examination were selected, contacted by mail or telephone and had indicated their willingness to participate in the follow-up. Thus, the task of the second 12 month period has been to assemble a cohort of 5,500-6,000 subjects.

II. Milestones and Deliverables Accomplished during the Reporting Period

Three milestones were envisaged by the Annual Work Proposal. All of those milestones were fulfilled during the reporting period. However, the experience of the first year of operation and, particularly, feedback from the epidemiological branch of the project, called for certain improvements in the design of the cohort assembling effort. A short summary of the results and recent considerations are presented in the following sub-sections.

Milestone 1. Inventory and update existing reliable dosimetric information and screen for incoming individuals with doses reconstructed retrospectively.

As was described in previous progress reports, the main source of information regarding individual doses of Liquidators was the State Chernobyl Registry (SCR) of Ukraine. Other, yet relatively less powerful, sources of dosimetric data were dose reconstruction files (i.e. EPR dosimetry with teeth). However, information contained in the SCR lacks data on the affiliations of Liquidators and, therefore, dosimetric practices (the methods of dosimetric monitoring, measurement errors, possibility of administrative pressure and falsification of doses etc) in individual cases were not retrievable from the SCR file. Therefore, prior to the use of SCR data,

an extensive postal survey was needed in order to learn how the doses were evaluated and to identify the administrative bodies in charge of operations and dosimetric monitoring of the Liquidators at the time of the clean-up. After applying this procedure, it became possible to filter out Liquidators who belonged to the branches known for their poor dosimetric practices (i.e. early visitors to the 30-km zone) and, thus, enlist into the cataract study only those Liquidations who possessed reasonable dosimetric records. During year one of the project the described approach was essentially the primary pathway for enlisting patients to the study, yielding 53% of the assembled cohort. Nevertheless, this approach had demonstrated certain weaknesses. First of all, the efficiency of enlisting (response rate) was not very high – approximately 60% of potential candidates did not respond to our postal inquiries. Second, according to the feedback from the epidemiological branch of the project, quite significant effort was needed to engage into examination those Liquidators who had already agreed to participate in the project. In practical terms it means that each Liquidator needs to be contacted twice – once during dosimetric survey and for the second time while inviting him/her for ophthalmic examination. This pattern could be simplified, if dosimetric information is beforehand of known origin and quality. Such a simplified approach was successfully tested, for instance, with EPR dosimetric files in which dosimetrists forwarded the lists of candidates with good dosimetric information to epidemiologists for further invitation to examination. The lists contained full ID data, addresses and, sometimes, telephone numbers of the patients and, thus, provided all the keys for the successful recruitment of Liquidators.

Therefore, the first year of operation had led us to conclude that the emphasis in cohort assembling should be shifted from a postal survey of Liquidators (attempting to reconstruct the origin and quality of their dosimetric records) to the acquisition of reliable, good quality dosimetric data beforehand. Upon linkage of these files with the ID database of the SCR and creation of complete lists of Liquidators with dosimetric data of previously known quality data, this information will then be forwarded to the epidemiological branch for recruiting individuals into the study.

As soon as this conclusion was derived, the work on acquiring a dosimetric monitoring database began. The main problem was caused by the fact that such information was dispersed in many local databases and corporate registries, most of them located in Russia. However, with the assistance of Dr. Victor Krjuchkov (Institute of Biophysics, Moscow) and with support from Columbia University all available information was acquired and delivered to the dosimetric branch of the UACOS. However, this information has been in a raw form, thus requiring, extensive work to establish linkage with the SCR files. Description of source databases is presented in Table I.

Work on record linkage is now in progress. Adding to the complexity of this task is the incompleteness of identifiers (for instance, initials instead of full names) and a need for verification of consistency of names, dates of work and dose values as recorded in these databases. However, some preliminary results of the record linkage effort assure a yield of at least another 11-12 thousand individuals whose doses were instrumentally measured at the time of clean up.

During the reporting period tooth samples from the Liquidators residing in the oblasts (regions) of interest continued to accumulate. However, due to deficiency of domestic funding, this work was conducted at a relatively low level. During the third semester, teeth from 173 Liquidators were collected in the respective regions of Ukraine for dose reconstruction purposes.

Table 1. Summary of dosimetric databases acquired during the 3rd semester

#	Database name	Number of unique entries	Information of dosimetric significance	Identifiers	Affiliation of Liquidators
1	CNII	18,715	<ul style="list-style-type: none"> ▪ Dose ▪ Period of work (31% of records) ▪ Date of last recording of dose 	<ul style="list-style-type: none"> ▪ Family name ▪ Name ▪ Patronymic ▪ Year of birth (9% of records) 	Database of the USSR Atomic Energy Ministry
2	PERSON1	57,524	<ul style="list-style-type: none"> ▪ Dose ▪ Period of work ▪ Date of last recording of dose ▪ Detailed affiliation 	<ul style="list-style-type: none"> ▪ Family name ▪ Initials ▪ Year of birth (71% of records) ▪ Passport number 	Sent on mission to the 30-km zone
3	PBK2	14,617	<ul style="list-style-type: none"> ▪ Dose 	<ul style="list-style-type: none"> ▪ Family name ▪ Initials 	Sent on mission to Chernobyl NPP
4	IDK	23,249	<ul style="list-style-type: none"> ▪ Dose ▪ Period of work (56% of records) ▪ Date of last recording of dose ▪ Affiliation 	<ul style="list-style-type: none"> ▪ Family name ▪ Initials ▪ Year of birth ▪ Passport number (72% of records) 	Permanent employees in the 30-km zone
5	PERSON	13,584	<ul style="list-style-type: none"> ▪ Dose ▪ Affiliation 	<ul style="list-style-type: none"> ▪ Family name ▪ Name ▪ Patronymic ▪ Date of birth ▪ Home address ▪ Passport number (36% of records) 	Employees of the USSR Atomic Energy Ministry
6	UVOL	40,730	<ul style="list-style-type: none"> ▪ Dose ▪ Period of work (42% of records) ▪ Date of last recording of dose ▪ Affiliation 	<ul style="list-style-type: none"> ▪ Family name ▪ Initials ▪ Year of birth ▪ Passport number (40% of records) 	Released employees of the 30-km zone

Other sources of retrospective dosimetry yielded 475 persons with doses reconstructed using Analytical Dose Reconstruction (ADR). These records contain full ID data and the complete addresses of the Liquidators. Among the 475 persons, 236 were from the Chernobyl NPP file and 239 from the dose reconstruction department of the State Enterprise, RADEC.

Milestone 2. Tracing and locating the Liquidators selected from dosimetric criteria.

This milestone was basically accomplished during the 1st semester. The results of this work were explicitly discussed in the 1st and 2nd progress reports. Information on the addresses of Liquidators included into the SCR, verified during the first 12-month period, was forwarded to the epidemiological branch of the project and was used for inviting patients to be examined.

In general, work on contacting the Liquidators had moved to the oblasts (regions) themselves and was continued by local personnel trained and assigned to examine the Liquidators.

Nevertheless, during the third semester, the information on actual addresses and living status of the Liquidators was still upgraded by acquiring up-to-date addresses and data on their assignments to local hospitals from the tooth ID forms. The tooth ID forms also include telephone numbers of Liquidators thereby facilitating contacts with Liquidators.

In addition, all retrospective dosimetry files include the recent addresses of Liquidations. After the intense work needed to recover addresses for past dose reconstruction data (see the 2nd semester report), all new results of on-going dose reconstruction are accompanied by complete addresses and other ID data.

Milestone 3. Enlisting patients into the study.

Although the major portion of the work during the reporting period was related to the acquisition of relevant dosimetric information, enlisting the patients into the study continued during this semester as well.

As was explained in previous progress reports, postal contact with Liquidators was a method of choice to enlist patients into the study during the first 12-month period. Such contact was performed using a special information packet, which included a statement of goals and conditions of the study, a dosimetric mini-questionnaire and instructions regarding filling out the questionnaire. The questionnaire itself had included several questions of dosimetric significance as well as a separate item determining the willingness of the patient to participate in ophthalmic follow-up.

Although in the 3rd quarter the main effort focused on the elaboration of the lists of Liquidators with dosimetry of previously known quality, the postal survey packets scheduled for mailing were also assembled. During the reporting period a total of 973 information packets were sent to the Poltava and Zaporizja oblasts (regions). In fact, by sending 266 letters to the Zaporizja oblast, 100% coverage of Liquidators in this oblast was achieved by postal survey. In Dnipropetrovsk oblast 100% coverage was achieved earlier, in other oblasts coverage ranges from 38 to 42% with

average of 57%. As a result of this work 810 Liquidations were included into examination lists and were forwarded to epidemiological branch of the project. This number includes both responses given to previous bids of survey (undertaken in 1st and 2nd semesters) and information packages sent during the 3rd quarter. A breakdown of enlisted Liquidators by oblasts (regions) is given in Table 2.

In addition, lists of Liquidators possessing retrospectively assessed doses (see Milestone 1 section) were forwarded to the epidemiological branch of the study. A total of 648 Liquidators were enlisted in this way. The structure of this group is presented in the respective columns of Table 2.

In total, during the reporting period, the lists, containing 1,458 Liquidators' names Liquidators selected for cataract follow-up were provided to the epidemiological branch of UACOS. In addition, in order to avoid interrupting the ophthalmic examination process, a list of 3,679 Liquidators was sent for consideration to the Dnipropetrovsk oblast. This list included clean up workers to whom the information packets were sent but who did not respond to our postal inquire. The plan, proposed by epidemiologists, envisages contacting these Liquidators locally and filling out dosimetric mini questionnaires during the course of the ophthalmic examination. Thereafter the dosimetric mini-questionnaires will be analyzed *post factum* and cohort members will be approved by dosimetrists post- examination. It is expected that this approach would increase the response rate without significantly extending the examination work. The last point requires further explanation. As the dosimetric survey in Dnipropetrovsk oblast had revealed, an absolute majority (about 98%) of the Dnipropetrovsk Liquidators were approved by dosimetric consideration for inclusion into the study cohort. Therefore, the expected excess eye examinations will be negligibly small, promising the success of this plan.

Table 2. Summary of cohort assembling during the 3rd semester

Region	Source of dosimetric information				Total
	EPR	Analytical	State Registry (postal survey)	State Registry (candidates for contacting locally)	
Kharkiv	22	7	163		192
Poltava	69		298		367
Zaporizja		6	86		92
Donetsk			256		256
Dnipropetrovsk			7	3679	3686
Kiev	82	462			544
Total	173	475	810	3679	5137

III. Other relevant information

In the framework of Ukrainian-American Leukemia Study a new method of Soft Expert Assessment of Doses (SEAD) was developed and partially tested. This method envisages interviewing clean-up workers with a special questionnaire form, jointly developed by the Russia-Ukraine-France-USA International Dosimetric Group, and subsequent expert evaluation of dose using special procedures, which exploits a fuzzy logic approach. This inventive technique has the advantage of applicability to all groups of Liquidators and does not depend on the availability of biological samples (as EPR or FISH) or past dose records. Upon completion of the validation of this technique, it might be used for the purposes of the eye study. Furthermore, certain modifications of the technique would greatly aid in the evaluation of beta dose to the eye lens.

IV. Publications

1. V.V.Chumak Methodologies – Strength and Weakness: A View on the Dosimetric Support for the Chernobyl Liquidator Eye Cataract Study. In: Ocular Radiation Risk Assessment in populations Exposed to Environmental Radiation Contamination. A.K.Junk, Y.Kundiev, P.Vitte and B.V.Worgul – editors, Kluwer Academic Publishers, 1999.