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**PROGRESS REPORT
February 1994**

CHERNOBYL STUDIES PROJECT

**WORKING GROUP 7.0
ENVIRONMENTAL TRANSPORT
AND HEALTH EFFECTS**

April 1, 1994

Technical Editor

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MASTER

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- Progress Report — February 1994

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Lynn Anspaugh

Lawrence Livermore National Laboratory

- **EH Monthly Detailed Summary**
- **Progress Report — February 1994**

BACKGROUND

BACKGROUND

In April 1988, the US and the former-USSR signed a Memorandum of Cooperation (MOC) for Civilian Nuclear Reactor Safety; this MOC was a direct result of the accident at the Chernobyl Nuclear Power Plant Unit 4 and the following efforts by the two countries to implement a joint program to improve the safety of nuclear power plants and to understand the implications of environmental releases. A Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) was formed to implement the MOC. The JCCCNRS established many working groups; most of these were the responsibility of the Nuclear Regulatory Commission, as far as the US participation was concerned. The lone exception was Working Group 7 on Environmental Transport and Health Effects, for which the US participation was the responsibility of the US Department of Energy (DOE). The purpose of Working Group 7 was succinctly stated to be, "To develop jointly methods to project rapidly the health effects of any future nuclear reactor accident." To implement the work DOE then formed two subworking groups: 7.1 to address Environmental Transport and 7.2 to address Health Effects. Thus, the DOE-funded Chernobyl Studies Project began. The majority of the initial tasks for this project are completed or near completion.

The focus is now turned to the issue of health effects from the Chernobyl accident. Currently, we are involved in and making progress on the case-control and co-hort studies of thyroid diseases among Belarussian children. Dosimetric aspects are a fundamental part of these studies. We are currently working to implement similar studies in Ukraine. A major part of the effort of these projects is supporting these studies, both by providing methods and applications of dose reconstruction and by providing support and equipment for the medical teams.

During Fiscal Year 1993, the work conducted under the auspices of Working Sub-Groups 7.1 and 7.2 was substantially changed, and many tasks were completed. Thus, the two Sub-Groups were combined into a single Group 7.

Current FY 94 tasks for the Chernobyl Studies Project are

7.0A Management

Lynn Anspaugh and Sheilah Hendrickson
Lawrence Livermore National Laboratory.

7.1C External Dose

Harold Beck
Environmental Measurements Laboratory.

7.1F Hydrological Transport

Yasuo Onishi

Battelle Pacific Northwest Laboratories

(\$50 K direct funding to PNL). Expected completion in FY 94.

7.2A4 Chromosome Painting Dosimetry

Tore Straume and Joe Lucas

Lawrence Livermore National Laboratory.

7.2D Stochastic Effects

Marvin Goldman

University of California, Davis.

Expected completion in FY 94.

7.2F Thyroid Studies

Lynn Anspaugh

Lawrence Livermore National Laboratory.

7.2G Leukemia Studies

Lynn Anspaugh

Lawrence Livermore National Laboratory.

7.0A — MANAGEMENT

EH Monthly Summary

Chernobyl Studies Project: Summary of Financial Status

Budget Category: HA-01-17

(1,000 Dollars)

Month Ending: February 1994

DOE Project Number	LLNL Project Number	Project Title	FY 1994 Budget*	FY 1994 Total Cost To Date**	Percent Spent	Remaining Balance	Variance Linear Rate***
93-ES-966	6288-15	7.0A Management L. Anspaugh / S. Hendrickson (LLNL)	240.4	106.9	44%	133.5	7
	6288-08	7.1C External Dose Harold Beck (EML) L. Anspaugh / S. Hendrickson (LLNL)	122.0	0.0	0%	122.0	(51)
	XXXX	7.1F Hydrological Transport Yasao Onishi (PNL) \$\$\$\$ Direct Funding to PNL	50.0	21.0	42%	29.0	0
	6288-09	7.2A4 Chromosome Painting Dosimetry Tore Straume / Joe Lucas (LLNL)	100.0	7.9	8%	92.1	(34)
	6288-11	7.2D Stochastic Effects IntraUniversity Transaction to Marvin Goldman (UC Davis, \$24 K) L. Anspaugh / S. Hendrickson (LLNL)	38.0	3.6	9%	34.4	(12)
			24.0	1.8	8%	22.2	(8)
	6288-16	7.2F Thyroid Studies Lynn Anspaugh (LLNL)	510.0	96.1	19%	413.9	(116)
	6288-12	7.2G Leukemia Studies Lynn Anspaugh (LLNL)	80.0	0.0	0%	80.0	(33)
LLNL TOTALS			\$1,090.4	\$214.5	20%	\$875.9	(240)

* Includes FY 1993 carryover

** Includes commitments (Liens, Subcontracts, IUTs, ICOs, etc.)

*** Amount in parenthesis () indicates total cost to date is under the cumulative linear spending rate

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EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:
7.0A Manangement (Lynn Anspaugh / Sheilah Hendrickson)

LLNL No: 6288-15
DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993			1994									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits	7.5	13.3	5.5	6.8	3.2								36.3
Travel	2.9	0.4	5.6	0.5	3.4								12.8
Procurement and Expenses*	0.7	0.1	0.3	0.3	2.5								3.9
Technical Information Department	0.0	0.0	0.0	0.0	0.0								0.0
Facility/Service/Distributed Charges	0.1	0.1	0.2	0.4	0.2								1.0
LLNL Overhead+/Taxes**	5.9	9.5	4.8	29.5	3.2								52.9
TOTAL	17.1	23.4	16.4	37.5	12.5								106.9
Liens/Preliens													
Budget	240.4	240.4	240.4	240.4	240.4								
Funds Available	223.3	199.9	183.5	146.0	133.5								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts													
** General & Administrative (G&A)													
+ LDRD; Division and Directorate Burdens, etc.													

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EH-40 Monthly Report

February 1994

Project Title: Chernobyl Studies
7.0A Management

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-15

Principal Investigator(s): Lynn Anspaugh / Sheilah Hendrickson
M&O Contractor: Lawrence Livermore National Laboratory

Address each item, if applicable.

- I. **Project Objective**
- II. **Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. **Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. **Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

I. Project Objective

The main content of this work will continue to be to manage the overall activities of former subgroups 7.1 and 7.2, to integrate all remaining tasks into a coherent and focussed program, and to provide the additional support for buying and furnishing supplies. An additional charge is to maintain coordination with other studies of similar nature, so that duplication is avoided and the maximum leverage is obtained with the funding that is available. At the present time the European Union (formerly known as the Commission of European Communities) has a large, well-funded program that has similar goals. Thus, one of our primary goals is to maintain a close liaison with the managers of the European Union program and with the managers of other programs that have potential overlap with the DOE-funded projects.

II. Current Project Status / Monthly Progress

Activities have been to manage the contracts and coordinate activities and information for work being done outside of LLNL. This includes the work being done by (1) Professor Goldman of the University of California, Davis, on completing the project on assimilating data from the former Soviet Union on radiogenic health effects (for events and accidents occurring prior to the Chernobyl accident), (2) Dr. Yasuo Onishi of Battelle Pacific Northwest Laboratory, on completing the project on assessing radionuclide migration in the water and soil environment with mathematical modeling to provide information on potential health impact and remediation requirements associated with the Chernobyl accident, and (3) Mr. Harold Beck of Environmental Measurements Laboratory, on improving and validating methods of forecasting doses and dose commitments from external exposure. We are also managing the contract and administrative details for work being done by SENES, Oak Ridge, on international model-validation studies. This project is now much broader in scope than just Chernobyl, and the agreement has been with

Dr. Thomas and others to not include this as a direct part of the Chernobyl Project. However, the project is currently being managed through this activity.

Other activities in support of our joint studies have been to purchase and ship computer software to the Belarussian scientists for our cohort studies and to the Ukrainian scientists for our epidemiological studies.

III. Significant Problems/Issues/Concerns

We need specific guidance on the continuing issue of providing equipment and supplies to Belarus (and later to Ukraine), as specified in the Protocol (October 1993-January 1994, Progress Report, 7.0A—Management) for the cohort study on childhood-thyroid cancer. Also, we need specific guidance from DOE on the future of the contract with SENES, Oak Ridge.

7.1C — EXTERNAL DOSE

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.1C External Dose [Harold Beck—EML] (Lynn Anspaugh / Sheilah Hendrickson)

LLNL No: 6288-08

DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
													0.0
Salary/Benefits													0.0
Travel													0.0
Procurement and Expenses*													0.0
Technical Information Department													0.0
Facility/Service/Distributed Charges													0.0
LLNL Overhead+/Taxes**													0.0
TOTAL				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liens/Preliens													
Budget				122.0	122.0								
Funds Available				122.0	122.0								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

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EH-40 Monthly Report

February 1994

Project Title: Chernobyl Studies
7.1C External Dose

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-08

Principal Investigator: (Harold Beck, Environmental Measurements Laboratory)
M&O Contractor: Lawrence Livermore National Laboratory
Lynn Anspaugh / Sheilah Hendrickson

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**

Administrative (meetings organized).
Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**

Substantial changes in project expectations, protocol, funding.
Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**

Identify EH-40 staff member(s) with each requests.

With the agreement of Mr. Beck this report has been prepared by Lynn Anspaugh.

I. Project Objective

To improve and validate methods of forecasting doses and dose commitments from external exposure. This is of major importance, as the external dose from the Chernobyl accident (and most other releases of radioactive materials to the environment) is a major contributor to dose. As ^{137}Cs is now the dominant radionuclide and it has a half-life of 30 years, this is a long-term problem that cannot be adequately resolved within a short time period.

II. Current Project Status / Monthly Progress

The central goal of this project is to validate models of projecting external dose far into the future—at least 30 years. This project has not yet been very active, as we have awaited the accumulation of significant data sets against which models can be tested.

A formal workshop is being planned for August 1994 in New York City. At this meeting the best external dose modelers in the world will analyze the existing data and test their models against it. The expected result is the development of a consensus model of projection of external exposure rate with time.

After the workshop is completed and a report prepared, it is presumed that this activity will be considered completed. However, it is hoped that data on external gamma-exposure rate will continue to be collected, and that model predictions can again be tested against real data at a future time.

III. Significant Problems/Issues/Concerns

None.

IV. Assistance Required of EH-40 Staff

None at this time.

**7.1F — HYDROLOGICAL
TRANSPORT**

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.1F Hydrological Transport (Yasao Onishi—PNL)

\$\$\$ DIRECT FUNDING TO PNL

LLNL No: none

DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits				16.9	2.9								19.8
Travel				0.9	0.9								1.8
Procurement and Expenses*				0.7	-0.6								0.1
Technical Information Department				0.0	0.0								0.0
Facility/Service/Distributed Charges				1.5	-2.2								-0.7
LLNL Overhead+/Taxes**				n/a	n/a								0.0
TOTAL	0.0	0.0	0.0	20.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
Liens/Preliens													
Budget	50.0	50.0	50.0	50.0	50.0								
Funds Available	50.0	50.0	50.0	30.0	29.0								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

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EH-40 Monthly Report

February 1994

Project Title: Chernobyl Studies
7.1F Hydrological Transport

DOE Project Number: 94-ES-1031

LLNL Project Number: N/A

Principal Investigator: Yasuo Onishi

M&O Contractor: Pacific Northwest Laboratory (direct funding)

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

\$\$\$ DIRECT FUNDING TO PNL

I. Project Objectives

The project objective is to assess radionuclide migration in the water and soil environment with mathematical modeling to provide information on potential health impact and remediation requirement associated with the Chernobyl accident. Specifically, radionuclide distributions in the Pripyat-Dnieper river system from the Chernobyl Nuclear Plant to the Black Sea will be predicted under major flooding of the Pripyat River, because flooding can significantly increase radionuclide concentrations in these rivers. For the Iput River basin in Russia, we will combine Landsat data and available Chernobyl data to characterize the area. These results will then be fed to a watershed/groundwater model to predict potential runoff and soil scouring areas from where ^{137}Cs can migrate overland to receiving surface water. Identification of major radionuclide source locations could be used for potential remedial activities. We will also initiate to examine radionuclide contaminations in the groundwater near the Chernobyl Nuclear Plant to study interactions with the Pripyat River, especially during flooding periods.

These studies test/improve predictive methodologies for aquatic environmental assessment. The study results themselves will also be used by CIS countries for identifying necessary remediation activities and their effectiveness.

II. Current Project Status/Monthly Progress

We are in a process of hosting three Ukrainians at PNL to work on our joint USA/CIS 7.1.F Program of JCCCNRS for three to four months with an assistance from U.S.

Department of Commerce's Special American Business Intern Training (SABIT) Program. SABIT will provide the travel expenses and their monthly incomes for the selected CIS scientists, so it will be cost effective for us to jointly conduct the 7.1.F studies in this manner.

SABIT approved the following three Ukrainians to be hosted by PNL to work on the Chernobyl Study being conducted under our joint USA/CIS 7.1.F program. They are

Dr. Pavel V. Tkalich at the Cybernetic Centers in Kiev,
Dr. Serguei Kivva at the Cybernetic Centers in Kiev, and
Dr. Igor Bilyi at the Ukrainian Institute of Hydrometeorology, Kiev.

We are expecting them to come to PNL from the mid April/early May for three to four months.

Dr. Bilyi will work with us to simulate radionuclide migration in the Pripjat River flood plain, while Dr. Tkalich will be involved in radionuclide migration in the Dnieper river from the Kiev Reservoir to its mouth at the Black Sea. Dr. Kivva will work with us to examine interactions of radionuclides in the groundwater near the Chernobyl Nuclear Plant with the Pripjat River, especially during flooding periods through modeling.

III. Significant Problems/Issues/Concerns

No new issues.

IV. Assistance Required of EH-40 Staff

No new assistance requested.

**7.2A4 — CHROMOSOME
PAINTING DOSIMETRY**

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.2A4 Chromosome Painting Dosimetry (Tore Straume / Joe Lucas)

LLNL No: 6288-09

DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits					4.6								4.6
Travel					0.6								0.6
Procurement and Expenses*					0.0								0.0
Technical Information Department					0.0								0.0
Facility/Service/Distributed Charges					0.0								0.0
LLNL Overhead+/Taxes**					2.7								2.7
TOTAL					7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9
Liens/Preliens													
Budget					100.0								
Funds Available					92.1								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

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EH-40 Monthly Report

February 1994

Project Title: Chernobyl Studies
7.2A4 Chromosome-Painting Dosimetry

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-09

Principal Investigators: Tore Straume and Joe Lucas
M&O Contractor: Lawrence Livermore National Laboratory
(Lynn Anspaugh / Sheilah Hendrickson)

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

I. Project Objective

The project objective is to use chromosome painting to provide dose estimates for selected individuals as needed for post-Chernobyl-accident surveillance and epidemiology studies.

II. Current Project Status / Monthly Progress

Funding received in January 1994 Financial Plan and released for spending in late February 1994.

In February 1994, we received a blood sample from a Ukrainian who was exposed to a known dose in connection with the Chernobyl accident. This individual was selected for study because of the level of ^{137}Cs exposure and the availability of independent measurements that facilitates intercalibration of biodosimetry (chromosome painting) with other dosimetric methods. By the end of February, we had scored 2,799 cells and found 14 translocations using chromosome painting with probes for chromosomes 1, 2, & 4. Dicentrics were distinguished from reciprocal translocations using a pan centromeric probe developed in our lab (Lucas et al. 1992, Straume and Lucas 1993). We will continue to score this individual until we reach ~20% statistics.

III. Significant Problems/Issues/Concerns

N/A.

IV. Assistance Required of EH-40 Staff

N/A.

7.2D — STOCHASTIC EFFECTS

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

LLNL No: 6288-11

Project:

DOE No: 94-ES-1031

7.2D Stochastic Effects [Marvin Goldman—UCD] (Lynn Anspaugh / Sheilah Hendrickson)

7.2D Stochastic Effects [Marvin Goldman—UCD] (Lynn Anspaugh / Sherran Henderson)

Cost Item	Months												Year-to-Date
	1993			1994									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits				0.5	0.3								0.8
Travel				0.0	0.0								0.0
Procurement and Expenses*				1.3	0.6								1.9
Technical Information Department				0.0	0.0								0.0
Facility/Service/Distributed Charges				0.0	0.4								0.4
LLNL Overhead+/Taxes**				0.2	0.3								0.5
TOTAL				2.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6
Liens/Preliens IUT \$24 K			24.0	23.5	22.2								
Budget			38.0	38.0	38.0								
Funds Available			38.0	36.0	34.4								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts													
** General & Administrative (G&A)													
+ LDRD; Division and Directorate Burdens, etc.													

6/10/94

EH-40 Monthly Report

February, 1994

Project Title: Chernobyl Studies
7.2D Stochastic Effects

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-11

Principal Investigator: Marvin Goldman
M&O Contractor: Lawrence Livermore National Laboratory
(Lynn Anspaugh / Sheilah Hendrickson)

Contract to:
IntraUniversity Transaction (UT): UC, Davis

Address each item, if applicable.

I. Project Objective

Complete and print proceedings for the bilateral stochastic workshop held at the University of California, Davis, June 15-19, 1992. Participants used the most recent estimates of stochastic risk to understand somatic effects of low-level radiation. The proceedings will also include reviewed data compiled on the exposed populations from the South Urals regions of Russia.

II. Current Project Status / Monthly Progress Administrative (meetings organized).

Began organizing meeting of Russians to come to California in June.

Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).

None.

Travel. Include copy of foreign trip report.

None.

III. Significant Problems/Issues/Concerns Substantial changes in project expectations, protocol, funding. Problems occurring or anticipated (corrective actions).

None.

IV. Assistance Required of EH-40 Staff Identify EH-40 staff member(s) with each requests.

None.

7.2F — THYROID STUDIES

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:
7.2F Thyroid Studies (Lynn Anspaugh)

LLNL No: 6288-16
DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits	16.2	7.3	14.0	4.8	7.0								49.3
Travel	1.6	0.0	0.6	2.5	-2.0								2.7
Procurement and Expenses*	1.1	0.1	0.0	1.1	2.6								4.9
Technical Information Department	0.3	0.0	0.0	0.6	0.3								1.2
Facility/Service/Distributed Charges	0.0	0.2	1.1	0.0	0.1								1.4
LLNL Overhead+/Taxes**	11.7	5.3	10.1	4.1	5.4								36.6
TOTAL	30.9	12.9	25.8	13.1	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.1
Liens/Preliens													
Budget	510.0	510.0	510.0	510.0	510.0								
Funds Available	479.1	466.2	440.4	427.3	413.9								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

6/10/94

EH-40 Monthly Report

February 1994

Project Title: Chernobyl Studies
7.2F Thyroid Studies

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-16

Principal Investigator: Lynn Ansbaugh

M&O Contractor: Lawrence Livermore National Laboratory

Address each item, if applicable.

- I. **Project Objective**
- II. **Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. **Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. **Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

I. Project Objective

To develop and implement a long term epidemiology study to detect thyroid disease among persons, especially children, who were exposed to the iodine radionuclides during and/or following the Chernobyl accident. (1) Develop a clinical surveillance program for a large fixed cohort of known tissue dose, particularly in children, (2) and agree on procedures for detecting thyroid dysfunction, methods to define and reconstruct exposure levels and doses, and ways in which standardization of procedures and quality control might be assured, and (3) identify and facilitate needs for training, equipment and supplies to conduct the study.

The primary goals at this time are to conduct case-control and cohort studies of childhood-thyroid cancer in Belarus and Ukraine.

The epidemiological aspects of these projects are being undertaken by scientists at the National Cancer Institute, who are assisted with funding from the Department of Energy, Office of Health. The goal of the work described here is twofold: (1) to provide radiation doses to the thyroid for the Ukrainian and Belarussian individuals to be studied (this work is being performed by Ukrainian, Belarussian, and Russian scientists with the advice and assistance of Lynn Ansbaugh and André Bouville of the National Cancer Institute) and (2) to provide material and equipment to the Ukrainian, Belarussian, and Russian scientists to aid in the overall aspects (including clinical) of the studies.

II. Current Project Status / Monthly Progress

Lynn Anspaugh with a delegation of US dosimetrists and epidemiologist met with Belarussian and Russian scientists working on the case-control and cohort studies of childhood-thyroid cancer among children exposed to fallout from the Chernobyl accident in Belarus. Much progress has been made in defining initial estimates of dose for the children in the case-control study. Further progress was also made on plans for the cohort study, which is just beginning. Initial and encouraging results were also reported from LLNL for the contemporary measurements of ^{129}I in soil as a surrogate for the original deposition of ^{131}I in soil. A foreign trip report is attached.

III. Significant Problems/Issues/Concerns

The protocol for the Belarussian cohort study indicates the delivery of a large amount of equipment and supplies to the Belarussian Minister of Health. As yet, no mechanism to accomplish this has been formally approved by the DOE, although LLNL has volunteered to manage and track this process. An early decision on this is important in order to move ahead in an orderly way.

IV. Assistance Required of EH-40 Staff

See Section III above. We are awaiting a decision by Dr. Harry Pettengill.

FOREIGN TRIP REPORT

Lynn R. Anspaugh

**Risk Sciences Center
Health and Ecological Assessment Division
Physical Sciences Directorate
Lawrence Livermore National Laboratory
University of California
Livermore, CA 94551-9900**

Contract No. W-7405-Eng-48

March 31, 1994

SECTION A: SUMMARY

a. Traveler

Lynn R. Anspaugh
Director
Risk Sciences Center
(510) 424-6409
Health and Ecological Assessment Division
Physical Sciences Directorate
Lawrence Livermore National Laboratory
University of California
Livermore, CA 94551-9900

March 31, 1994

b. Dates and Destinations

2/14/94-2/18/94

Scientific Institute of Radiation Medicine,
Minsk, Belarus

c. Purpose of the Trip

To continue progress on two epidemiological studies of childhood-thyroid cancer in Belarus following the accident at the Chernobyl Nuclear Power Station.

d. Abstract

A delegation of US dosimetrists and epidemiologists met with Belarussian and Russian scientists working on the case-control and cohort studies of childhood-thyroid cancer among children exposed to fallout from the Chernobyl accident in Belarus. Much progress has been made in defining initial estimates of dose for the children in the case-control study, although the epidemiologists desire that the work be done over again so that the methods used for all cases and controls would be exactly the same. That is, no attempt would be made to use additional information to refine dose estimates for some individuals for whom such knowledge is available. Further progress was also made on plans for the cohort study, which is just beginning. Initial and encouraging results were also reported from LLNL for the contemporary measurements of ^{129}I in soil as a surrogate for the original deposition of ^{131}I in soil.

SECTION B: TRIP REPORT

a. Purpose of the Trip

To continue progress on two epidemiological studies of childhood-thyroid cancer in Belarus following the accident at the Chernobyl Nuclear Power Station. These studies are being conducted by the Ministry of Health in Belarus with the assistance of scientists from the Institute of Biophysics in Russia and with the collaboration of US scientists.

b. Summary of Activities

Much of the following material was prepared by Dr. André Bouville, who was the other US dosimetrist on this trip.

1. INTRODUCTION.

The trip to Minsk had two main purposes: (1) review the status of the case-control study of thyroid cancer among Belarussian children that was begun two years ago, and (2) complete the protocol of the cohort study and discuss the first stages of its implementation.

The US delegation consisted of Lynn Anspaugh, Gil Beebe, André Bouville, Bertrand Brill, Jack Robbins, Bruce Wachholz, and Myron Waclawiw. We were divided into working groups during most of the week. Lynn Anspaugh and André Bouville were the full-time US participants in the dosimetry working group. Our counterparts were Viktor Minenko, Vladimir Drozdovich, Elena Pusenkova, Elena Shemyakina, and Alexander Ulanovsky from Belarus, and Valeri Khrushch, Yuri Gavrilin, and Sergei Shinkarev from Russia. We requested and obtained ad hoc participation of Gil Beebe, Jack Robbins, and Myron Waclawiw (clarification of the constraints imposed by the epidemiologists with respect to the thyroid-dose estimation for individuals in the case-control study) and of Randy Brill and Artur Kuvshinnikov (data-base management for the dosimetric system).

The focus of this trip report is on the dosimetric aspects of the case-control and cohort studies of thyroid cancer among Belarussian children. We did not have enough time to discuss in detail all the items that were on our agenda; issues that need to be discussed more extensively are indicated in bold, italicized characters.

2. CASE-CONTROL STUDY OF THYROID CANCER.

2.1. Estimates of thyroid-dose range for each case and each control.

As requested in the research protocol for the case-control study, each of the 119 cases and 236 controls has been assigned to a dose category (0-0.3 Gy, 0.3-1 Gy, or >1 Gy) on the basis of the currently available information for the purposes of a preliminary analysis. The results are presented in a report, in Russian, prepared by our colleagues from Minsk, with the title "Research on the case-control thyroid cancers among Belarussian children. Report for the year 1993 (Dosimetric part);" a copy of that report was given to us. Cases and controls are divided into three groups:

- Group 1: Children with direct thyroid measurements. There are 12 cases and 0 controls in that group.
- Group 2: Children with "passport" doses. There are 61 cases and 59 controls in that group.
- Group 3: Children without direct thyroid measurements or passport doses. For those children, use is made of the ^{137}Cs -deposition density, which is available for all localities (and provided in the report for the localities of interest). There are 46 cases and 177 controls in that group.

For each of the three groups, the methods of thyroid-dose estimation have been developed by our Russian colleagues. Uncertainties on the thyroid-dose estimates are smallest for group-1 individuals and highest for group-3 individuals. Those uncertainties are greatly reduced for individuals that responded to personal interviews on their lifestyle and dietary habits (assuming that the reported answers are reliable, especially with regard to milk consumption).

Personal interviews were conducted in various ways and with different questionnaires, and the quality of the information received varies from individual to individual. There are reasons to believe that many individuals did not provide a correct answer with respect to their milk consumption; they found it to their interest to underestimate their milk consumption in early interviews when they recalled that they had been instructed not to drink local milk, and they may have overestimated their milk consumption in recent interviews when they believed that compensation might be given to individuals with high thyroid-dose estimates. Our Russian colleagues analyzed the milk-consumption data included in the 109,000 questionnaires that they had collected in 1988 and concluded that less than 30% are reliable. They also find that the distribution of the milk-consumption rates reported for the 119 cases is very narrow, implying that the results are suspect. *The determination of the method to be used in order to obtain a realistic assessment of the milk consumption from the personal interviews is a very*

important task that should be considered with urgency. The current situation with respect to the interviews of cases and controls is as follows:

- Dosimetrists conducted personal interviews for 45 cases. Seven of those cases were interviewed a second time (*Question for Viktor Minenko: how do the milk consumption rates compare for the children who were interviewed twice?*).
- Nineteen cases in 1988 were interviewed when our Russian colleagues organized the process of interviewing the people who lived in the most contaminated areas of Belarus at the time of the accident.
- Endocrinologists interviewed all other cases, with the tendency of glossing over the dosimetric questions.
- All 236 controls were sent a questionnaire by mail. As of 15 February responses had been received for 144 controls, and new responses were arriving every day.

As indicated previously, all cases and controls have been assigned to a dose category, and the results are presented in the Belarussian report. In addition, the Belarussian report presents, for the localities where the cases and controls reside, the ^{137}Cs -deposition densities and an indication of the types of additional environmental radiation data that are available.

The Russians as well gave us a copy of a report that they had prepared for this meeting. It is also in Russian and is titled "Report concerning stage no. 4 of the agreement no. 7 of January 1993 on the scientific research related to the verification and the determination of individual thyroid doses. Progress report on a method of direct determination of ^{129}I content in processed samples." The report includes in particular (1) a description of the method used to estimate individual thyroid doses in the absence of direct thyroid measurements and of passport doses (the basic information used is the ^{137}Cs deposition density), and (2) estimates of thyroid doses for 51 cases and 233 controls. *It is our understanding that the methods described in this report were used by the Belarussians to prepare their thyroid-dose estimates.*

Even though the methodology used to estimate the thyroid-dose ranges provided in the Belarussian report seemed to the dosimetrists to be in agreement with the indications given in the research protocol and to satisfy the purposes of the preliminary epidemiological analysis, the epidemiologists were not satisfied because the doses had not been calculated using the same type of information and the same method for all cases and controls. After a long discussion, it was decided to provide the epidemiologists with two sets of dose estimates:

(1) the "zero-approach" doses, obtained using only the information that is available for all cases and controls, which is the ^{137}Cs -deposition density in the locality of residence and the statistical relationships observed between the ^{137}Cs -deposition density and the thyroid doses estimated for the 130,000 individuals with direct thyroid measurements. *Any information, such as the direct thyroid measurements, the passport doses, or the responses to questionnaires, available for some individuals and not for others, will be ignored.* The doses thus obtained will be expressed in terms of dose ranges;

(2) best estimates, obtained using all the information that is available for each individual case or control. *Information such as the direct thyroid measurements, the passport doses, or the responses to questionnaires, will be used if it is deemed to be helpful.* The doses thus obtained will be expressed as best estimates accompanied with upper and lower bounds.

Both sets of dose estimates will be prepared by our Russian and Belarussian colleagues. This task is to be completed by 1 April 1994. The dose estimates will be analyzed by the epidemiologists and a joint publication will be prepared, hopefully before the end of the year.

It is to be remembered that the preliminary epidemiological analysis will be followed in a few years by a more refined analysis, which will be based on more accurate dose estimates. In order to obtain more accurate dose estimates, an effort should be made to assess the individual milk-consumption rates with reliability and to determine as well as possible the time-integrated concentrations of ^{131}I in grass.

2.2. Iodine-129 measurements.

Tore Straume has developed at Livermore a fast and sensitive technique (using accelerator-mass spectrometry) to measure ^{129}I in environmental samples. It is hoped that the content of ^{129}I in soil will be shown to be more closely related to the ^{131}I -deposition density than to that of ^{137}Cs . In order to find out if this is the case, soil samples with previously measured concentrations of ^{131}I and ^{137}Cs (provided last year by Sergei Panchenko) are being analyzed at Livermore. The first results, concerning six samples, are encouraging, but a larger database is needed to draw a more definitive conclusion. Lynn Anspaugh agreed that a few samples, to be selected jointly with our Belarussian colleagues, should be sent to Japan for intercalibration purposes.

During the meeting, our Russian colleagues provided Lynn Anspaugh with 21 milk samples originating from the southern part of the Gomel Oblast. Those samples were analyzed in May 1986 for ^{131}I , ^{134}Cs , and ^{137}Cs , and again in February 1994 for ^{134}Cs and ^{137}Cs .

About half of the soil samples that had been collected in May 1993 by the international team from Belarus, Russia, and the US (assisted by personnel from GSF, Germany) have been prepared in Minsk for transport to the US. Unfortunately, the Belarussian customs did not permit us to take the soil samples out of the country. *It is hoped that our Belarussian colleagues will be able to find a solution to this problem in the near future.*

Our Russian colleagues, at the Institute of Biophysics, are working on a different technique (β -x-ray-coincidence analysis) to measure ^{129}I . They believe that they will be able to measure ^{129}I in environmental samples from areas with ^{137}Cs -deposition densities as low as 5 Ci km^{-2} , if two x-ray detectors are provided to them. In addition, they expressed the wish to have two scientists trained in the US: Взорov Дмитрий Игоревич, a physicist who speaks English well, and Макаренкова Ирина Ивановна, a chemist involved in the iodine-separation technique, who also speaks English.

2.3. Status of iodine-131 map.

The iodine-131 map that was described to us by Marya Germenchuk two years ago is now official. However, neither a description of how the map was prepared nor tabulated data showing estimated ^{131}I -deposition densities for given settlements or cities have been made available to our Belarussian colleagues. As it stands, the map is of little interest, but the numerical data that were used to prepare it could be extremely helpful, assuming that they could be validated. In an effort to obtain more information on the way the map was derived, and, eventually to be involved in the validation of that map, it was decided that the American dosimetrists should address a written request in Russian to Matve'enko, who is responsible for the preparation of the map. The English version of this letter is attached as Appendix 1; this letter was translated by Larisa Anspaugh, and was sent to Matve'enko.

Along the same line, it would be very useful to obtain detailed information on the rainfall pattern over the contaminated areas during the days when fallout occurred. During a recent meeting in Vienna, Dr. Bouville had asked Acad. Yuri A. Izrael, who was the head of the State Committee on Hydrometeorology at the time of the Chernobyl accident, where this information could be found. Acad. Izrael advised writing a letter to A.I. Bedritsky in Moscow and to mention his name in the request. The English version of this letter is attached as Appendix 2. This letter was also translated by Larisa Anspaugh and has been sent to Bedritsky. In addition, our Russian colleagues have learned that Sergei Panchenko and Oleg Pavlovsky (former employees of the Institute of Biophysics) had collected precipitation data for the Mogilev region. It is hoped that they will not object to sharing this information with us.

3. COHORT STUDY OF THYROID CANCER.

3.1. Status of the protocol.

The report concerning the technical review of the protocol that was made by independent US scientists is available and Viktor Minenko was given a copy of it. The US peer reviewers recommended that clarification be made regarding some aspects of the dosimetry; this clarification could be included either in the protocol or in the operations manual. The decision was made to include all of the requested clarifications in the dosimetric part of the operations manual (which remains to be written). The requested clarifications are discussed in section 3.2 of this document.

As a result of the comments made by the US peer reviewers, a few changes were made to the protocol, in areas other than dosimetry, after discussion with Drs. Astakhova and Stozharov. The protocol is now finished and is to be sent shortly to the NCI Institutional Review Board for approval and then to DOE for implementation of expected funding.

3.2. Operations manual.

The dosimetrists should prepare an operations manual, in which all the procedures needed to estimate the thyroid doses will be written in detail. *Viktor Minenko asked whether there would be only one operations manual, in which all the procedures used by the dosimetrists, the epidemiologists, the clinicians, the pathologists, and the surgeons would be found, or whether there would be one operations manual for each specialty. The US position is that the Belarussians should do what is convenient for them, but that the operations procedures should be consistent and without overlap. For example, the possibility of overlap exists with regard to the personal interviews. It would be highly recommended to have a single questionnaire and to have the interviews conducted in an uniform manner by skilled interviewers, who would be neither dosimetrists nor clinicians. No decision has been made yet on how many interviewers are needed and if, when, where, or how they will be trained.*

The comments made by the US peer reviewers that relate to dosimetry and should be taken care of in the operations manual are as follows:

- Uncertainty analysis: The methods that will be used to estimate the uncertainties, both for the thyroid measurements and the estimates based on environmental transport, should be defined explicitly. Immediate and thorough attention to the analysis of the uncertainties associated with the external measurement of thyroid content is highly

recommended. Response: Total agreement that this should be done (see section 3.3 for a discussion of the thyroid measurements);

- What is the number of children evaluated with each type of instrument? Response from our Russian colleagues: 75% of the measurements that were used for individual-dose calculations were carried out with the DP-5, about 20% with the SRP-68, and a few percent with the DRGZ;
- Include in the questionnaire whether the individuals measured wore clean clothes at the time of the thyroid measurements. Response from our Russian colleagues: This information, which is available for about half of the people that were measured, could be requested in the questionnaire;
- What was the selection process that defined the 200,000 people whose thyroid contents were measured? Were they a random sample or were more high-dose individuals selectively included? Response: There was no individual selectivity in the settlements where thyroid measurements were carried out. In the Raions of Hoiniki, Bragin, and Narovlia (Gomel Oblast), the measurements were carried out in almost all settlements. In other areas, the measurements were carried out predominantly in the most contaminated settlements;
- State the number of children exposed in utero. Response: The information is not readily available;
- Indicate the relative importance of gestational age on the dose. Response: This information can be provided easily.

It is not clear yet when and where the dosimetrists are going to prepare their operations manual. It is hoped that it will be a joint effort of the Belarussians and of the Russians, with the Americans as advisers. The operations manual should have an English and a Russian version. A visit to the US by a Russian and a Belarussian could be envisaged. Sergei Shinkarev may be the Russian dosimetrist assigned to prepare the operations manual.

3.3. Re-evaluation of the calibration of the thyroid-measuring devices.

As far as dosimetry is concerned, the re-evaluation of the calibration of the thyroid-measuring devices is a priority.

The program that was begun in 1992 includes three parts:

- Determination of the response of the various types of detectors, using point sources, as a function of energy, angle and distance: This task was

carried out in Minsk for the SRP-68 detector. The available point sources were not strong enough to permit the same types of measurement for the other types of detectors (DP-5 and DRGZ);

- Determination of the influence of the size and position of the thyroid with respect to the detector, using thyroid phantoms and human subjects with known amounts of ^{131}I : The thyroid phantoms for babies and children will be derived from the adult-thyroid phantom that was developed at the University of Washington. Measurements with these phantoms will be carried out in New York while Monte-Carlo calculations will be done in Minsk;
- Determination of the influence of radionuclides other than ^{131}I in the thyroid and of the contamination of the skin and of the body, as well as that of clothes and other objects, on the detector response: This is the most difficult part of the program. The source term (nature, location, and concentrations of radionuclides) will be determined in Moscow. Measurements, using crude phantoms, will be made in New York. Monte-Carlo calculations will be carried out in Oak Ridge by Keith Eckerman's group. The possibility of inviting Alexander Ulanovsky to spend 2 to 3 months in Oak Ridge to participate in the Monte-Carlo calculations has been discussed.

In order to prepare Monte-Carlo programs, Alexander Ulanovsky asked us if we could provide him with the following reports:

- Cristy, M. and Eckerman, K.F. *Specific absorbed fractions of energy at various energies from internal photon sources*. ORNL/TM-8381/Volumes 1 to 7 (1987).
- Cristy, M. *Mathematical phantoms....* ORNL/NUREG/TM-367 (1980).
- Cristy, M. *Mathematical phantoms....* ORNL/TM-9487 (1985).

André Bouville has the responsibility to propose a detailed program, which will be presented for comments to all the participants. This should be done in March.

3.4. Selection of sample.

According to the protocol, the sample will consist of 15,000 children with direct thyroid measurements. Concern was expressed by our Belarussian and Russian colleagues about whether it will be possible to locate that many

people with thyroid measurements. After discussing this with the epidemiologists, it was decided:

- To look first for children with good thyroid measurements (about 8,000);
- To attempt to locate all children with estimated thyroid doses greater than 1 Gy, irrespective of the quality of the measurements;
- To prepare for the epidemiologists histograms of uncertainties, expressed as ratios of upper bounds to best estimates, for three-dose intervals (0–0.3 Gy, 0.3–1 Gy, and >1 Gy). The epidemiologists will then decide how to sample children in the low-dose categories (0–0.3 Gy and 0.3–1 Gy) and whether it should be envisaged to sample children who have no thyroid measurement, but good passport doses).

3.5. Priorities for equipment and supplies.

The priorities for equipment and supplies for the dosimetric teams in Minsk and Moscow were worked out in discussions with Lynn Anspaugh and Randy Brill. The preliminary list is as follows:

Priority 1 (equipment that could be delivered by October 1994):

- One personal computer 486DX2, 66 MHz, 32-MB RAM, HARD DRIVE 2 X 600 MB, CD-ROM (read and write), fax modem, UPS. Cost: About \$5,000.
- One Hewlett-Packard (or machine of similar capability) workstation with plotter and software for drawing and 3-D imaging. Cost: About \$5,000.
- Two laser printers (e.g., Hewlett Packard Laserjet 4), with toner and additional cartridges. Cost: About \$4,000.
- One dot-matrix (24-pin) printer (e.g., Epson LQ series). Cost: About \$500.
- (For Moscow) two personal computers 486DX2 (e.g., Compaq), cache 512, 66 MHz, 16-MB RAM, HARD DRIVE 320 MB, VESA or ISA card, 1 MB, .28 monitor, CD-ROM (read and write), FVGA, FAX modem, and mini-tower. Cost: About \$10,000.
- (For Moscow) one modem. Cost: About \$450.

- (For Moscow) one printer (e.g., Epson LQ-11-70). Cost: About \$800.
- (For Moscow) one laser printer (e.g., Hewlett Packard Laserjet 4). Cost: About \$1,500.

Priority 2 (equipment that could be delivered between October 1994 and October 1995):

- One personal computer 486DX2, 66 MHz, 32-MB RAM, HARD DRIVE 2 X 600 MB, UPS. Cost: About \$5,000.
- One portable high-purity Ge based γ -spectrometer for field-spectrometry work, with accessories. Cost: About \$40,000.
- One high-temperature TLD system (e.g., Harshaw 3500), including options for ceramic sample preparation. Cost: About \$30,000.
- One four-wheel-drive vehicle. Cost: About \$15,000.
- One notebook computer 486, 16-MB RAM, HARD DRIVE 300 MB. Cost: About \$4,000.
- Three Canon bubble-jet-style printers for laptop computers, with additional toner (ink). Cost: About \$1,000.
- One dot-matrix (24-pin) printer (e.g., Epson LQ series). Cost: About \$500.
- One liquid nitrogen transfer station with liquid nitrogen tanks (Dewars). Cost: About \$5,000.
- (For Moscow) two x-ray-spectrometry systems with right-angle geometry. Cost: About \$30,000.

Priority 3 (equipment that could be delivered after October 1995):

- Two stationary high-purity Ge based γ -spectrometers with detectors made from low-background materials and with low-background shields. Cost: About \$80,000.
- One portable high-purity Ge based γ -spectrometer for field-spectrometry work, with accessories. Cost: About \$40,000.
- One four-wheel-drive vehicle. Cost: About \$15,000.

- (For Moscow) one γ -ray spectrometry system. Cost: About \$15,000.

3.6. Database management.

Viktor Minenko expressed the wish to have Кухта Татьяна Сергеевна, who speaks English well, to be trained in the US in the field of database management, data processing, and computer networks. As our Belarussian colleagues seemed to be unaware of the overall database-management scheme that is being developed by Artur Kuvshinnikov and Randy Brill, we asked Artur and Randy to join us to discuss it. It was decided that the Belarussian dosimetrists should explain to Artur what their computer problems are. Artur will do his best to solve these problems; he may advise that somebody should be trained in the US, if the computer problems of the dosimetrists necessitate such training.

3.7. Harmonization of software.

It is anticipated that the need for communication is going to be greater in the near future as the case-control study is written up, the cohort study begins, and publications are prepared. We will do our best to communicate by electronic mail, and to use Word for Windows® (version 2.0) as a word-processing language, Excel® for spreadsheets, and Crystal Ball® for uncertainty analyses.

4. PUBLICATIONS.

Lynn Ansbaugh and André Bouville will do their best to help the Belarussian and the Russian dosimetrists have their work published in western scientific journals. Our advice is that they should prepare a rough draft in English that we will comment upon for revision. We are also prepared to facilitate the interaction with the scientific journals.

c. Traveler's Role

My role is described above in Part b. In general, I am one of the two US dosimetrists working on these projects.

d. Recommendations

The studies are progressing satisfactorily. However, many details remain to be worked out, and the cooperation within the groups in Belarus could be

improved. These studies are very important to the Minister of Health, and I hope that the commitment of the US will remain steadfast.

e. Information Pertinent to Energy Postures

None.

f. Security-Related Concerns

None.

SECTION C: APPENDIX

a. Itinerary

2/12/94	Left San Francisco
2/13/94	Arrived Frankfurt
2/14/94	Left Frankfurt/Arrived Minsk via Vienna
2/18/94	Left Minsk/Arrived Vienna
2/19/94	Left Vienna/Arrived San Francisco via New York

b. List of Persons contacted

The people contacted are named in Section B, Part b.

c. Literature Acquired

As discussed in Section B, Part b, we received copies of two papers in Russian—one written by our Russian colleagues and one by our Belarussian colleagues. Both deal with the calculation of doses for the individuals in the childhood-thyroid-cancer case-control study.

APPENDIX 1

(letter requesting information on the ^{131}I map)

Dr. I.I. Matve'enko
Primary Center for Radiation Control
220645, Minsk
Boulevard F. Skorini, 110-A
FAX: 7-0172-64-03-35

Dear Dr. Matve'enko

The National Cancer Institute, in cooperation with Belarussian and Russian scientists, is conducting an epidemiological study of thyroid cancer and other diseases among Belarussian children exposed to iodine-131 fallout resulting from the Chernobyl accident.

We understand that you have prepared a map showing the iodine-131 deposition over the entire Republic of Belarus. We would appreciate it very much if you could provide us with such a map, along with a detailed description of how the map was derived.

Yours sincerely.

APPENDIX 2

(letter requesting information on the rainfall pattern)

Dr. A.I. Bedritsky
Head, Federal Services for Hydrometeorology
Novovaganskovskay street
N12
Moscow, Russia

Dear Dr. Bedritsky

The National Cancer Institute, in cooperation with Belarussian and Russian scientists, is conducting an epidemiological study of thyroid cancer and other diseases among Belarussian children exposed to iodine-131 fallout resulting from the Chernobyl accident.

In order to estimate thyroid doses to individual children, it is very important to obtain as detailed information as possible on the rainfall pattern over the territory of Belarus, especially on 27 and 28 April 1986, but also until 10 May 1986.

We discussed this problem with Professor Yuri Izrael during a meeting in Vienna. Professor Izrael indicated that you might be in a position to help us. We would be very grateful to you if you could tell us what type of information is available on rainfall over the area and time period indicated above.

Yours sincerely.

7.2G — LEUKEMIA STUDIES

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:
7.2G Leukemia Studies (Lynn Anspaugh)

LLNL No: 6288-12
DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits													0.0
Travel													0.0
Procurement and Expenses*													0.0
Technical Information Department													0.0
Facility/Service/Distributed Charges													0.0
LLNL Overhead+/Taxes**													0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liens/Preliens													
Budget	80.0	80.0	80.0	80.0	80.0								
Funds Available	80.0	80.0	80.0	80.0	80.0								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Overhead, etc.													

6/10/94

EH-40 Monthly Report

February 1994

Project Title: Chernobyl Studies
7.2G Leukemia Studies

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-12

Principal Investigator: Lynn Anspaugh
M&O Contractor: Lawrence Livermore National Laboratory

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
Administrative (meetings organized).
Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
Substantial changes in project expectations, protocol, funding.
Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
Identify EH-40 staff member(s) with each requests.

I. Project Objective

Development of a protocol (study plan) for a systematic epidemiologic and etiologic study of the post-Chernobyl experience with leukemia. Obtain new information on time-response, dose-response and influence of dose rate on radiation leukemogenesis by (a) develop a leukemia registry to establish two cohorts (clean-up workers and fall-out victims); plan a case-control study of clean-up workers; (b) standardize and validate diagnose of leukemia, promote physical dose reconstruction; explore potential of biological dosimetry for case-control study of clean-up workers; (c) identify need and facilitate ancillary training needs for selected former-soviet scientists.

The primary goal at this time is to conduct a study of leukemia incidence among liquidators (or other highly exposed individuals) in cooperation with Ministry of Health officials in Ukraine.

The epidemiological aspects of this project is being undertaken by scientists at the National Cancer Institute, who are assisted with funding from the Department of Energy, Office of Health. The goal of the work described here is to provide radiation doses to the bone marrow for the individuals to be studied (this work is being performed by Ukrainian scientists with the advice and assistance of Lynn Anspaugh and André Bouville of the National Cancer Institute).

II. Current Project Status / Monthly Progress

No further progress.

III. Significant Problems/Issues/Concerns

N/A.

IV. Assistance Required of EH-40 Staff

N/A.

DATE

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8 / 11 / 94

END