



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555-0001

January 17, 1997

MEMORANDUM TO: Wayne E. Davis, Chief
Records and Archives Services Section
Information and Records Management Branch
Office of Information Resources Management

FROM: Cherie Siegel, Management Analyst *Cherie Siegel*
Office for Analysis and Evaluation
of Operational Data

SUBJECT: DOCUMENTATION FOR NUREG-1535, "INGESTION OF PHOSPHORUS-32 AT
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE,
MASSACHUSETTS, IDENTIFIED ON AUGUST 19, 1995"

Under separate cover, I am sending you the documentation that was collected to support the subject NUREG. These documents were utilized by the Incident Investigation Team (IIT) to substantiate the findings and conclusions for this NUREG. This documentation will be sent to you in two boxes--one box will contain those records that are to be placed in the Agency file system; and one box will contain those records that are to be placed in the PDR. Please be advised that the records to be placed in the Agency file system have been bracketed to indicate those portions that are not to be released to the public; and the PDR documents (duplicates of the others) have had the unreleasable portions redacted in black or eliminated (if the entire record is to be denied to the public). Also included in each box is a copy of the listing of documents (bibliography) which clearly states those records that are releasable either in part or in their entirety as well as those records that are totally unreleasable. (Please pick up appropriate fields for PDR indexing.)

For your information, the numbers located in the upper right corner of all records contain the following information: the first series of numbers (10) indicates that this is the tenth IIT; the second series indicates the year in which the IIT was conducted (95); the third series indicates the chronological number given to the document, which corresponds to the number listed in the enclosed bibliography. Therefore, 10-95-01 is document number 1 listed in the bibliography. Please note that there will be documents not listed in the bibliography, nor will they be included in our submittal. That is because only those utilized by the IIT to substantiate the findings and conclusions were retained by the team. Those documents utilized for review purposes only were destroyed, in accordance with the IIT administrative procedures.

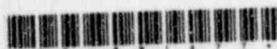
*Limited Distribution: PDR
Central files
NUREG Abstract*

DFD3

*ISP-11 Guidelines
manuals*

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Wayne E. Davis

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Please be advised that the determinations made for availability to the public were with the assistance and advice of the Office of the General Counsel and the Office of Investigations. Further, all documents being submitted to the Agency file system are the record copies. If I can be of any further assistance or provide any additional information, please do not hesitate to contact me on 415-6384. Thank you very much for your continuing cooperation.

Attachment:
Bibliography for NUREG-1535

NUREG-1535
INGESTION OF PHOSPHORUS-32 AT MASSACHUSETTS
INSTITUTE OF TECHNOLOGY (MIT)
IIT BIBLIOGRAPHY

10-95

- ✓ 1. Memorandum to Chairman Jackson and Commissioner Rogers from James Taylor, NRC, 10/17/95 -- INVESTIGATION OF A PHOSPHOROUS-32 INTERNAL CONTAMINATION AT THE CANCER RESEARCH CENTER, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, MASSACHUSETTS.
- ✓ 2. Preliminary Notification PNO-I-95-044, UPTAKE OF 579 MICROCURIES OF PHOSPHORUS-32 BY AN INDIVIDUAL, 10/16/95.
- ✓ 3. Bulletin Board Notice to Site Personnel - 10/17/95 - WEEK OF AUGUST 14, 1995 -- PHOSPHOROUS-32 INTERNAL CONTAMINATION AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, MA.
- ✓ 4. Environmental Medical Service Organizational Chart.
- ✓ 6. Entrance Meeting Attendance Sheet - 10/17/95.
- NOT IN
EX
126/97 ALB
✓ 9. MIT Campus Police Report, Incident Number 95008306, 08/19/95. **
- NOT IN
EX
126/97 ALB
✓ 10. Letter to Anne Glavin, Chief, MIT Campus Police from Harry Hemond, Chairman, Radiation Protection Committee, 09/26/95 with attachment of letter to Dr. Yuqing Li, MIT from Harry Hemond, 09/27/95 regarding radioactive contamination. **
- NOT IN
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126/97 ALB
✓ 11. Fax to Lieutenant David McCoy, MIT Campus Police from Yuqing Li, MIT, 09/06/95 -- DETAILED INFORMATION ABOUT THE POISONING INCIDENT. **

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- * = Predecisional Document - Not to be released
 - ** = Not releasable per OI
 - # = Personal Information - [REDACTED]
 - ## = Personal Information - Not to be released
 - + = Proprietary Information - Not to be released

✓ 12. Preliminary Notification, PNO-IIT-95-01, STATUS REPORT FROM NRC INCIDENT INVESTIGATION TEAM, 10/18/95.

✓ 13. Entrance Meeting Transcript, 10/17/95. *INCIDENT INVESTIGATION TEAM MEETING*
2/26/97 ACP

14. Documents provided by Dr. Yuqing Li, MIT after 10/18/95 interview.

- NOT IN BOX 2/26/97 ACP*
- a. Whole Body Measurements ##
 - NOT IN BOX 2/26/97 ACP* b. 32-P Calibration of Whole Body Counts ##
 - ✓ c. Metabolic Data for Phosphorus
 - NOT IN BOX 2/26/97 ACP* d. Calculation of Intake -- 08/20/95 ##
 - NOT IN BOX 2/26/97 ACP* e. Survey Records -- dates unknown ##
 - NOT IN BOX 2/26/97 ACP* f. Dose Assessments -- 08/19-09/13/95 ##
 - NOT IN BOX 2/26/97 ACP* g. Fax to Dr. Li, MIT from Mitch Galanek, MIT, 10/12/95 -- EXPOSURE REPORT. ##
 - NOT IN BOX 2/26/97 ACP* h. Food purchase verification, 08/28/95 ##
 - NOT IN BOX 2/26/97 ACP* i. Dose Assessments -- 08/22-08/23/95 ##
 - NOT IN BOX 2/26/97 ACP* j. Record of discussion with Tonegawa, MIT, 08/28/95 ##
 - NOT IN BOX 2/26/97 ACP* k. Record of discussion with Masse, Galanek, and Sharp, MIT, 08/25/95 ##
 - ✓ l. Dr. Li's log book, 08/13-19/95
 - NOT IN BOX 2/26/97 ACP* m. Dr. Li's report to MIT Campus Police, 09/06/95 ##
 - NOT IN BOX 2/26/97 ACP* n. Dr. Li's radioisotope log, 08/31/95 ##
 - ✓ o. Note found on Dr. Li's desk, 09/23/94
 - NOT IN BOX 2/26/97 ACP* p. Collected documents of dose assessments, 08/24-09/30/95 ##
 - NOT IN BOX 2/26/97 ACP* q. Letter to Dr. Li, MIT from Harry Hemond, Chairman, Radiation Protection Committee, 09/27/95 +
 - NOT IN BOX 2/26/97 ACP* r. Intake evaluation by Joseph Ring, Radiation Protection Services, Groton, MA, 09/29/95 ##
 - NOT IN BOX 2/26/97 ACP* s. Report of dose assessment by Joseph Ring, Radiation Protection Services, Groton, MA, 10/15/95 ##
 - NOT IN BOX 2/26/97 ACP* t. Dr. Li's lab notebook, 08/13/95 ##

✓ 15. Whole Body Counter Spectrum of Background, 10/18/95.

✓ 16. Whole Body Counter Spectrum from Subject, 10/18/95.

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- ✓ 17. Printout showing times and dates of whole body counts on subject.
- MIT EIL Box
1/19/97 14-7-97 ✓ 18. Copy of whole body counter log showing dates and results of subject and phantom counts.
- ✓ 19. Receipt records for P-32 in Tonegawa Laboratory from June 1 through August 19, 1995.
- ✓ 22. Dr. Li's Urinalysis Activity Calculation Summary, 08/26-10/04/95 -- MIT Radiation Protection Office document.
- ✓ 23. Dr. Li's Urinalysis LSC Counter Results -- 08/21-10/12/95, MIT Radiation Protection Office document. #
- MIT IN Box
1/19/97 14-7-97 ✓ 24. Dr. Li's Whole Body Count - Activity Assessment -- 08/18-10/11/95, MIT Radiation Protection Office document. ##
- ✓ 25. MIT P-32 Calibration Curve for LSC.
- ✓ 26. MIT Radiation Protection Office Data for P-32 Calibration of Whole Body Counter, 08/22/95.
- ✓ 27. MIT Radiation Protection Office Urinalysis Bioassay Procedures.
- ✓ 28. MIT Radiation Protection Office Standard Forms for Laboratory Surveys and Records.
- ✓ 29. MIT Radiation Protection Office Package Receipt Procedures, 11/04/94.
- ✓ 30. MIT Medical Department - Contaminated Patient Guidelines.
- ✓ 31. * 3 FOLDERS ACS 8/18/97
MIT Folder "Required Procedures for Radiation Protection." Note: Folder contains information and procedures that RAM users are to follow, including Section G - Lab Surveys; Section H - Security; and Section N - Emergency Response.
- ✓ 32. Transcript: Interview of Mitchell S. Galanek, Associate RSO, MIT, 10/18/95.

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- ✓ 33.B Transcript: Interview of Dennis King, Lab Manager, MIT, 10/18/95.
- ✓ 34. Estimate of Usage of P-32 Handwritten Note by Dennis King, 09/01/95.
- ✓ 35. Radiation Safety Training Records for Tonegawa Lab Employees.
- ✓ 36. Radiation Safety Training Syllabus.
- ✓ 37. Minutes of the 117th Meeting of the Radiation Protection Committee on September 12, 1995.
- ✓ 38. *2/28/95 2/28/97 ACB* Whole Body Counter Spectrum of Calibration Sources in Phantom.
- ✓ 39. Subject Whole Body Count -- 09/22/95.
- ✓ 40. Subject Whole Body Count with Background Subtracted -- 09/22/95.
- ✓ 42. Diagram - Floor layout of Dr. Tonegawa's lab showing locations of his work area, RAM refrigerator, and cold <food> refrigerator.
- ✓ 43. Documents describing physical and chemical form of the material used by the researcher, specific activity, form, and size of container.
- ✓ 44.B Transcript: Interview with Dr. Yuqing Li, Researcher, MIT, 10/18/95.
- ✓ 45.B Transcript: Interview with Robert K. Burgess, Counting Room Technician, MIT, 10/18/95.
- ✓ 46. Background Spectrum with Gregory Goncek in the whole body counter chair, 10/19/95.
- ✓ 47. Published study of the MIT Whole Body Counter, Volume 19.
- ✓ 48. Memo to Frank Masse, MIT from John Glenn, NRC, 10/20/95 -- OFFICIAL POSITION OF MASSACHUSETTS INSTITUTE OF TECHNOLOGY ON DECISION NOT TO REPORT PHOSPHORUS-32 (P-32) CONTAMINATION.

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✓ 49.B Transcript: Interview of Mitchell S. Galanek, Associate RSO, MIT, 10/19/95.

✓ 50.B Transcript: Interview of Takuji Iwasato, Researcher, MIT, 10/19/95.

✓ 51.B Transcript: Interview of Hayden M. Prosser, Researcher, MIT, 10/19/95.

✓ 52.B Transcript: Interview of Dr. Yuqing Li, Researcher, MIT, 10/19/95.

✓ 53.B Transcript: Interview of Zhuo Qian, Researcher, MIT, 10/19/95.

✓ 54.B Transcript: Interview of Jie Shen, Researcher, MIT, 10/19/95.

✓ 55. Synopsis of MIT Enforcement History, License Number 20-01537-02 from John Kinneman, NRC Region I.

✓ 56. Memorandum to Chairman Jackson and Commissioner Rogers, from James Taylor, NRC, 10/20/95 -- MODIFICATIONS TO THE ONGOING INVESTIGATION AT MIT CANCER RESEARCH CENTER.

NOT IN
12/1/97 RCB
✓ 57. Documents provided by Captain John E. Driscoll, MIT Campus Police, 10/17/95.**

- a. MIT Campus Police Report, Incident Number 95008306, 08/19/95.**
- b. Tonegawa Lab Isotope Inventory/Distribution Plan, 09/01/95.**
- c. Fax to Lieutenant David McCoy, MIT Campus Police from Yuqing Li, MIT, 09/06/95 -- DETAILED INFORMATION ABOUT THE POISONING INCIDENT.**
- d. Note to File from Donald Haes, Assistant Radiation Protection Officer, 09/12/95 -- PROFESSOR TONEGAWA LAB P-32 INVENTORY ASSESSMENT.**
- e. Fax to David McCoy, MIT Campus Police from Dennis King, Lab Manager, 09/26/95 -- LIST OF LAB NUMBERS.**
- f. Dr. Li's log book, 08/13-19/95.**
- g. Letter to Anne Glavin, Chief, MIT Campus Police from Harry Hemond, Chairman, Radiation Protection Committee, 09/26/95 with attachment of letter to Dr. Yuqing Li, MIT from Harry Hemond, 09/27/95 regarding radioactive contamination.**

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- h. Science article entitled, "Deliberate Poisoning at NIH?," 07/28/95.
- i. TechMail for Windows message from Ken Campbell to John Driscoll, 10/17/95 -- NEWS RELEASE.**
- j. MIT News article entitled, "MIT Probing How Researcher was Contaminated in Laboratory," 10/16/95.
- k. MIT Campus Police Incident List (Computer Dump), 08/30/95.**

- 58. B Transcript: Interview of Dr. Yuqing Li, Researcher, MIT, 10/20/95.
- 59. B Transcript: Interview of Frank Masse, Radiation Safety Officer, MIT, 10/20/95.
- 60. B Transcript: Interview of Donald L. Haes, Jr., Assistant Radiation Safety Officer, MIT, 10/20/95.
- 61. B Transcript: Interview of Dr. Susumu Tonegawa, Professor of Biology, MIT, 10/20/95 (Transcription tape included).

✓ 62. Memorandum to James Taylor from Chairman Jackson, NRC, 10/13/95 -- NIH INCIDENT: FOLLOW-UP REGULATORY ACTIONS.

✓ 63. MIT Enforcement History, 1988-1995.

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✓ 64. Preliminary Sequence of Events, 10/22/95.*

✓ 65. B Transcript: Interview of Shu Ying Huang, Technical Associate, MIT, 10/20/95.

✓ 66. Preliminary Notification PNO-IIT-95-02. STATUS REPORT FROM NRC INCIDENT INVESTIGATION TEAM, 10/20/95.

✓ 67. B Transcript: Interview of John Murray, Officer, MIT Campus Police, 10/22/95.

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✓ 68. Fax to Cherie Siegel, IIT Team from Harriet Karagiannis, AEOD, 10/23/95 -- EVENTS RELATED TO MIT CASE FOR IIT'S INFORMATION FROM 07/29/81 THROUGH 06/28/95.

✓ 70. Procedure for EMS Response to Emergencies, July 1994.

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- ✓ 71. Hazardous Materials Training and Response Policy, MIT Campus Police, 08/03/93.
- ✓ 72. Direct DPM -- "Defining a DPM Assay."
- ✓ 73. Application for Authorization to Possess and Use Radioactive Material, Susumu Tonegawa, MIT, dated 05/30/95.
- ✓ 74. Record of Waste Picked Up from Professor Tonegawa in August, dated 08/14-18/95 and 08/21-25/95.
- ✓ 75. D. Haes Plots -- Proceedings of ICRP-30 Results of Y. Li P-32 Intake, Corrected to 08/14/95. #
- ✓ 76. D. Haes Rad Level "Body Map" of Y. Li -- Dose Rate Readings (mR/hr), 08/19/95.
- ✓ 78. Duties and Responsibilities of the Radiation Protection Committee.
- ✓ 79. Written Expectations Regarding Handling of RAM Issued by Radiation Protection Committee.

81. Photos

- ✗ a. Phantom -- 3 pieces, open, separate, on floor.
- ✓ b. Phantom -- in chair with chair open.
- ✗ c. Phantom -- in chair with chair closed.
- ✗ d. Whole body counter -- empty.
- ✗ e. Whole body counter -- with person.
- ✗ f. Dr. Li's lab area.
- g. Radiation material storage freezer/refrigerator.
- ✗ h. Radiation material storage freezer, open, showing locked storage box.
- ✓ i. Entrance to Center for Cancer Research.
- ✗ j. Combi-vial showing dimension.
- ✗ k. Pipetter.
- ✗ l. Plexiglass shield for P-32 work (Dr. Li's shield).
- ✗ m. General lab photos.
- 1. Radiation lab.

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2. Waste containers.
3. Centrifuges.
4. Lab hood.
5. Packard LSC.
6. Urine specimens.

✓ 82. Record of Analysis of Blood Sample Drawn from Dr. Li, 08/21/95.

NOT IN FILE
2/28/97 ACB
✓ 83. Records of Urinalysis Performed on other Employees in Tonegawa's Lab, 08/22/95.##

✓ 84. Meeting Minutes of the Radiation Protection Committee, 01/22/92 through 08/23/95.

LISTED AS M.I.T. RAD. PROTECT. OFF. 6/15/95 (SEE ATT. 5/885)
X 85. Radiation Safety Office Audits of Tonegawa's Lab -- July 1990 to Present.

✓ 86. Request for any written record or note showing initial dose estimate based on first urine specimen and total body fluid volume for Dr. Li by J. Glenn, IIT, 10/23/95.

NOT IN FILE
12/8/97 ACB
✓ 87. MIT Materials License, Number 20-01537-02, dated March 23, 1995. +

✓ 88. Additional Guidance for Interviewee/Transcript Reviewer, 10/24/95.

✓ 89/B Transcript: Interview of William Irwin, Assistant Radiation Protection Officer, MIT, 10/23/95.

✓ 90/B Transcript: Interview of Dr. Robert J. McCunney, Director, Environmental Medicine, MIT, 10/23/95.

✓ 91/B Transcript: Interview of Jacquelyn Yanch, Associate Professor of Nuclear Engineering and Whittaker College of Health Sciences and Technology, MIT, 10/23/95.

✓ 92/B Transcript: Interview of Dr. Joseph Ring, Health Physicist, Harvard Radiation Protection Office, Harvard, 10/23/95.

✓ 93/B Transcript: Interview of Peter Dedon, Assistant Professor of Toxicology, MIT, 10/23/95.

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10-95-85

* LISTED ON SHEET AS
* RE. RAD. SAFETY OFF. PROCEEDING

M.I.T. RADIATION PROTECTION OFFICE

GROUP RETRAINING SESSION HELD ON 6/15/95 @ 16:30

I. Identification of Authorization # CCIR m:

Project Supervisor: S. TUNEGAWA

Department: CCIR

Radionuclide	Possession Limit	Activity Used per Experiment (Maximum)	Physical/ Chemical Form	Current Possession Limit
^{32}P	40mCi	1mCi	Nucleosides	40mCi
^{125}I	80mCi	4-6mCi	NaI	80mCi
^3H	20mCi	2mCi	Nucleotides	20mCi
^{14}C	1mCi	100μCi	Amino Acids	1mCi
^{35}S	60mCi	10mCi	Nucleotides	60mCi
^{51}Cr	15mCi	2mCi	Sodium Chromate	15mCi

II. Information For Project Review:

A. Authorization, Section I:

1. Possession Limits.
2. Authorized Users.
3. Registered Laboratories.
4. Principal Procedures.
5. Radiation Protection Equipment.
6. Waste Disposal.


B. Authorization, Section II:

1. Specific Conditions of Approval:
2. Standard Conditions of Approval:

III. Miscellaneous Information.

IV. Signatures.


RPO Staff Member


Project Supervisor

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✓ 94.B Transcript: Interview of Kevin Wentzel, Assistant Professor, Nuclear Engineering Department, MIT, 10/23/95.

✓ 95.B Transcript: Interview of Harold F. Hemond, Professor of Civil and Environmental Engineering, MIT, 10/23/95.

✓ 96.B Transcript: Interview of Geoffrey Sirr, Tech A, MIT, 10/23/95.

✓ 97.B Transcript: Interview of Juan LaFaille, Post Doctorate and Associate, Tonegawa's Lab, MIT, 10/23/95.

✓ 98.B Transcript: Interview of Dr. David E. Housman, Professor of Biology, MIT, 10/23/95.

✓ 99. Memorandum to Guy Caputo, Director, Office of Investigations, NRC from Edward Jordan, Director, AEOD, NRC, 10/23/95 -- AVAILABILITY OF RECORDS COLLECTED AND MAINTAINED BY THE MIT INCIDENT INVESTIGATION TEAM (IIT).

✓ 100. Press Release from NRC Region I Office of Public Affairs -- NRC TO HOLD MEETING IN BOSTON TO DISCUSS INVESTIGATION INTO THE INGESTION OF RADIOACTIVE MATERIAL BY MIT RESEARCHER, 10/24/95.

✓ 101. Urine Sample Data and Analysis provided by the Contaminated Individual, 09/13 to 10/11/95.

NOT ON LIST
12/24/97 X 102. Analysis of the Licensee's Whole Body Counter Data provided by the Contaminated Individual, 08/19 to 10/18/95.##

✓ 103. Reference on Internal Contamination Investigation Levels provided by the Contaminated Individual, 10/23/95.

NOT ON LIST
12/28/97 X 104. Curve Fitting Data for Urine Samples provided by the Contaminated Individual, 10/23/95.##

NOT ON LIST
12/28/97 X 105. Curve Fitting for Urine Data, provided by the Contaminated Individual, 10/23/95.#

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106. Phosphorus Metabolic Data provided by the Contaminated Individual, 10/23/95.##

✓ 107. Records of any suspensions or probations imposed on Tonegawa's lab since July 1990; dated 12/22/93 and 03/06/94.

✓ 108. Records of contamination incidents report in the Cancer Center to Radiation Safety Office since July 1990, dated 07/22/94, 04/12/95, and 06/27/95.

✓ 109. Resumes of Radiation Safety Office Staff. #

✓ a. Frank Masse
✓ c. William E. Irwin
✓ e. Thomas P. Fuller
✓ g. Deying Sun
✓ i. Scott McLaughlin
✓ l. Robert Burgess
✓ n. Steven Greenlaw

✓ b. Mitchell S. Galanek
✓ d. Judith M. Reilly
✓ f. Donald L. Haes
✓ h. Geoffrey Sirr
✓ j. Kevin White
✓ m. William Prescott

✓ 110. Response to questions from IIT.

✓ 112. Letter to Thomas Martin, NRC from J.D. Litster, MIT, 10/24/95, RESPONSE TO NRC'S 10/17/95 LETTER.

✓ 113. Preliminary Notification PNO-IIT-95-03, STATUS REPORT FROM NRC INCIDENT INVESTIGATION TEAM, 10/25/95.

✓ 114. Memorandum to John Glenn, NRC from Frank Masse, MIT, 10/23/95 -- RESPONSE TO YOUR MEMO ON 10/20/95.

✓ 115. Exit Meeting Sign-in Sheet, 10/25/95.

✓ 117. Exit Meeting Transcript, 10/25/95.

✓ 133. NRC Inspection Manual, Chapter 2800, MATERIALS INSPECTION PROGRAM, 04/17/95.

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- ✓ 154. Draft Regulatory Guide DG-0005 (Second Proposed Revision 2 to Regulatory Guide 10.5), APPLICATIONS FOR LICENSES OF BROAD SCOPE, October 1994.
- ✓ 157. Regulatory Guide 10.5 (Revision 3), STANDARD REVIEW PLAN FOR APPLICATIONS FOR LICENSES OF BROAD SCOPE, June 1994.
- ✓ 160. Regulatory Guide 10.5 (Revision 1), APPLICATIONS FOR TYPE A LICENSES OF BROAD SCOPE, December 1980.
- ✓ 161. 10 CFR Part 20 Reporting Requirements, undated.
- ✓ 163. Draft Regulatory Guide and Value/Impact Statement -- Proposed Revision 2 to Regulatory Guide 10.5, February 1989.
- NOT IN FILE
2/12/89
✓ 164. Transcript: Initial Conference Call to Headquarters Operations Center, 10/16/95 (transcribed from HOO tape).*
- ✓ 171. Transcript: Interview of Dr. Carl J. Paperiello, Director, Office of Nuclear Materials, Safety and Safeguards, NRC, 10/31/95.
- ✓ F172. Transcript: Interview of James Dwyer, Senior Health Physicist, Medical Inspection Branch, Region I, NRC, 10/31/95.
- NOT IN FILE
2/12/89
✓ F175. Transcript: Interview of Dr. Donald A. Cool, Director, Division of Industrial and Medical Nuclear Safety, NMSS, NRC, 11/01/95. +
- NOT IN FILE
2/12/89
✓ F176. Transcript: Interview of Donna-Beth Howe, Health Physicist, Medical, Academic and Commercial Safety Branch, NMSS, NRC, 11/01/95. +
- ✓ F180. Preliminary Notification 78-25, CONTAMINATION INCIDENT, including a memorandum for H.E. Book's Personal File from H.E. Book, Chief, Fuel Facility and Materials Safety Branch, Region V, NRC -- RADIATION INCIDENT AT UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL IN SAN FRANCISCO, 12/08/78. +

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2/05/97
ACK
- ✓ 181. Preliminary Notification 78-35, CONTAMINATION INCIDENT, including a preliminary report -- PRELIMINARY PHOSPHOROUS-32 INTERNAL CONTAMINATION REPORT, 12/13/78. +
- ✓ 182. Listing of Subject Titles and Dates of all Information Notices issued by the NRC.
- ✓ 183. Basic Event Information Reports sent by V. Dricks, OPA/Region I, NRC.
- ✓ 184. Transcript: Interview of Susan Frant Shankman, Deputy Director, Division of Nuclear Materials Safety, Region I, NRC, 11/02/95.
- NOT IN BOX
2/28/97
ACK
- ✓ 185. Fax from the Atomic Energy Control Board, Ottawa, Canada, to William Upshaw, IP/NRC, 11/03/95 -- CANADIAN P-32 INCIDENT. +
- ✓ 187. States Agreement Memo from Richard Bangart, Director, Office of State Programs, 10/30/95 -- TRANSMITTAL OF STATE AGREEMENT PROGRAM INFORMATION (SP-95-17) including NRC Information Notice 95-51: RECENT INCIDENTS INVOLVING POTENTIAL LOSS OF CONTROL OF LICENSED MATERIAL, 10/27/95.
- ✓ 188. Letter to Cecil Brown, Chief, Radioactive Materials Section, North Carolina Department of Environment, Health, and Natural Resources from Davis Jorgensen, Duke University Medical Center -- RADIATION INCIDENT REPORT, 02/21/90 (cross reference 10-95-195). #
- ✓ 189. Note to Janet Schlueter, NMSS/NRC from Harriet Karagiannis, AEOD/NRC -- REQUEST FOR INFORMATION ON DATA INVOLVING P-32 CONTAMINATION, 07/25/95, including Basic Event Information Reports. (Note: Cross Reference with 10-95-183).
- ✓ 190. Note to Stu Rubin, AEOD/NRC from Pat Baranowsky, AEOD/NRC -- MEDICAL EVENTS RELATED TO THE NIH AND MIT EVENTS, 10/19/95.
- ✓ 191. Additional Information regarding the CANADIAN P-32 INCIDENT, received 11/03/95.

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- ✓ 192. NRC Information Notice 89-35: LOSS AND THEFT OF UNSECURED LICENSED MATERIAL, 03/30/89.
- ✓ 193. Memorandum to John Glenn, Chief, Radiation Protection and Health Effects Branch, RES/NRC, 11/02/95 -- TRIP REPORT-MIT.
- ✓ 195. Radiation Incident Report at Duke University that occurred on or about 04/16/88 (redacted version included - cross reference 10-95-188). #
- ✓ 196. Radiation Incident Report at Brown University on 02/05/82.
- ✓ 197. AEOD Procedure 3.3 -- SCREENING OF OPERATIONAL DATA AND INFORMATION NONREACTOR REPORTS.
- ✓ 198. B Transcript: Interview of Harriet Karagiannis, Senior Project Manager, AEOD/NRC and Sam Pettijohn, Data Analyst, AEOD/NRC, 11/06/95.
- ✓ 199. B Transcript: Interview of Patrick Baranowsky, Branch Chief, Reliability and Risk Assessment Branch, AEOD/NRC, 11/06/95.
- ✓ 200. B Transcript: Interview of Richard Bangart, Director, Office of State Programs, NRC and Paul Lohaus, Deputy Director, Office of State Programs, NRC, 11/06/95.
- ✓ 201. B Transcript: Interview of Joel Lubenau, Senior Health Physicist, NMSS/NRC, 11/07/95.
- ✓ 202. Briefing packages and reports of NMSS monthly Operational Events Briefings for 1988.
- NOT IN FAX
2-12-97
✓ 203. Fax to Cherie Siegel, NRC from Roy Collins, Atomic Energy Control Board, Canada, 11/08/95, ANALYSES RESULTS OF CANADIAN P-32 EVENT, INCLUDING WHOLE BODY COUNT.##
- ✓ 204. Preliminary Notifications: PNO-I-88-24 (dated 03/03/88); PNO-I-88-24A (dated 03/1988); PNO-I-88-24B (dated 03/14/88) -- WORKER DIGESTION OF P-32 AT ALBERT EINSTEIN MEDICAL CENTER, NEW YORK CITY.

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✓ 205. NMSS Briefing Sheet -- Operational Events Briefing, 07/01/91.

NOT IN FILE
2/28/97
✓ 207. Note to E. Ullrich, IIT/NRC from M. Galanek, MIT dated 11/08/95 -- P-32 STOCK VIALS AND MIT RECEIPT LOG.

✓ 208. Copies of records for radioisotope inventories, receipts, and disposals maintained by Dennis King, Lab Manager, MIT -- July 1992 to present.

✓ 210. American Association of Poison Control Center -- INTENTIONAL RADIOSCOPE EXPOSURES, 1983-1994.

✓ 211. Letter to David J. Litster, MIT from Thomas Martin, Regional Administrator, Region I/NRC -- CONFIRMATORY ACTION LETTER -- SUPPLEMENT 1, 10/27/95.

NOT IN FILE
2/28/97
✓ 213. Fax to John Glenn, IIT from Dr. Daniel Flynn, Lowell General Hospital -- PRELIMINARY CONSULTANT'S REPORT, 11/10/95.*

✓ 216. Letter to James Taylor, NRC from K. Mulholland, Veterans Administration, Bronx, New York -- RESPONSE LETTER INVOLVING EXCESSIVE EXPOSURE OF A RESEARCH WORKER TO IODINE-125, dated 04/12/85.

NOT IN FILE
2/28/97
✓ 217. Fax to Elizabeth Ullrich from M. Laudeman, Oak Ridge Institute for Science and Education (ORISE) -- PRELIMINARY URINE SAMPLE ANALYSES RESULTS, 11/22/95.*

✓ 218. Appendices to Analysis of Urine and Whole Body Data by Lawrence Livermore National Laboratory, 11/17/95.##

✓ 219. Medical Consultant Report dated 11/25/95.##

✓ 220. EDO Briefing Slides -- MIT IIT FINDINGS AND CONCLUSIONS, 11/29/95.

✓ 221. Transcript: Final Exit of Incident Investigation Team (with tapes), 12/8/95.

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 17, 1997

MEMORANDUM TO: Wayne E. Davis, Chief
Records and Archives Services Section
Information and Records Management Branch
Office of Information Resources Management

FROM: Cherie Siegel, Management Analyst *Cherie Siegel*
Office for Analysis and Evaluation
of Operational Data

SUBJECT: DOCUMENTATION FOR NUREG-1535, "INGESTION OF PHOSPHORUS-32 AT
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE,
MASSACHUSETTS, IDENTIFIED ON AUGUST 19, 1995"

Under separate cover, I am sending you the documentation that was collected to support the subject NUREG. These documents were utilized by the Incident Investigation Team (IIT) to substantiate the findings and conclusions for this NUREG. This documentation will be sent to you in two boxes--one box will contain those records that are to be placed in the Agency file system; and one box will contain those records that are to be placed in the PDR. Please be advised that the records to be placed in the Agency file system have been bracketed to indicate those portions that are not to be released to the public; and the PDR documents (duplicates of the others) have had the unreleasable portions redacted in black or eliminated (if the entire record is to be denied to the public). Also included in each box is a copy of the listing of documents (bibliography) which clearly states those records that are releasable either in part or in their entirety as well as those records that are totally unreleasable. (Please pick up appropriate fields for PDR indexing.)

For your information, the numbers located in the upper right corner of all records contain the following information: the first series of numbers (10) indicates that this is the tenth IIT; the second series indicates the year in which the IIT was conducted (95); the third series indicates the chronological number given to the document, which corresponds to the number listed in the enclosed bibliography. Therefore, 10-95-01 is document number 1 listed in the bibliography. Please note that there will be documents not listed in the bibliography, nor will they be included in our submittal. That is because only those utilized by the IIT to substantiate the findings and conclusions were retained by the team. Those documents utilized for review purposes only were destroyed, in accordance with the IIT administrative procedures.

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Wayne E. Davis

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January 17, 1997

Please be advised that the determinations made for availability to the public were with the assistance and advice of the Office of the General Counsel and the Office of Investigations. Further, all documents being submitted to the Agency file system are the record copies. If I can be of any further assistance or provide any additional information, please do not hesitate to contact me on 415-6384. Thank you very much for your continuing cooperation.

Attachment:
Bibliography for NUREG-1535

NUREG-1535
INGESTION OF PHOSPHORUS-32 AT MASSACHUSETTS
INSTITUTE OF TECHNOLOGY (MIT)
IIT BIBLIOGRAPHY

10-95

- ✓ 1. Memorandum to Chairman Jackson and Commissioner Rogers from James Taylor, NRC, 10/17/95 -- INVESTIGATION OF A PHOSPHOROUS-32 INTERNAL CONTAMINATION AT THE CANCER RESEARCH CENTER, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, MASSACHUSETTS.
- ✓ 2. Preliminary Notification PNO-I-95-044, UPTAKE OF 579 MICROCURIES OF PHOSPHORUS-32 BY AN INDIVIDUAL, 10/16/95.
- ✓ 3. Bulletin Board Notice to Site Personnel - 10/17/95 - WEEK OF AUGUST 14, 1995 -- PHOSPHOROUS-32 INTERNAL CONTAMINATION AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, MA.
- ✓ 4. Environmental Medical Service Organizational Chart.
- ✓ 6. Entrance Meeting Attendance Sheet - 10/17/95.
9. MIT Campus Police Report, Incident Number 95008306, 08/19/95. **
10. Letter to Anne Glavin, Chief, MIT Campus Police from Harry Hemond, Chairman, Radiation Protection Committee, 09/26/95 with attachment of letter to Dr. Yuqing Li, MIT from Harry Hemond, 09/27/95 regarding radioactive contamination. **
11. Fax to Lieutenant David McCoy, MIT Campus Police from Yuqing Li, MIT, 09/06/95 -- DETAILED INFORMATION ABOUT THE POISONING INCIDENT. **

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✓ 12. Preliminary Notification, PNO-IIT-95-01, STATUS REPORT FROM NRC INCIDENT INVESTIGATION TEAM, 10/18/95.

✓ 13.B Entrance Meeting Transcript, 10/17/95. *INCIDENT INVESTIGATION TEAM MEETING*
2/26/97 RLB

14. Documents provided by Dr. Yuqing Li, MIT after 10/18/95 interview.

- NOT IN BOX 2/26/97 RLB*
- a. Whole Body Measurements ##
 - NOT IN BOX 2/26/97 RLB* b. 32-P Calibration of Whole Body Counts ##
 - ✓ c. Metabolic Data for Phosphorus
 - NOT IN BOX 2/26/97 RLB* d. Calculation of Intake -- 08/20/95 ##
 - NOT IN BOX 2/26/97 RLB* e. Survey Records -- dates unknown ##
 - NOT IN BOX 2/26/97 RLB* f. Dose Assessments -- 08/19-09/13/95 ##
 - NOT IN BOX 2/26/97 RLB* g. Fax to Dr. Li, MIT from Mitch Galanek, MIT, 10/12/95 -- EXPOSURE REPORT. ##
 - NOT IN BOX 2/26/97 RLB* h. Food purchase verification, 08/28/95 ##
 - NOT IN BOX 2/26/97 RLB* i. Dose Assessments -- 08/22-08/23/95 ##
 - NOT IN BOX 2/26/97 RLB* j. Record of discussion with Tonegawa, MIT, 08/28/95 ##
 - NOT IN BOX 2/26/97 RLB* k. Record of discussion with Masse, Galanek, and Sharp, MIT, 08/25/95 ##
 - ✓ l. Dr. Li's log book, 08/13-19/95
 - NOT IN BOX 2/26/97 RLB* m. Dr. Li's report to MIT Campus Police, 09/06/95 ##
 - NOT IN BOX 2/26/97 RLB* n. Dr. Li's radioisotope log, 08/31/95 ##
 - ✓ o. Note found on Dr. Li's desk, 09/23/94
 - NOT IN BOX 2/26/97 RLB* p. Collected documents of dose assessments, 08/24-09/30/95 ##
 - NOT IN BOX 2/26/97 RLB* q. Letter to Dr. Li, MIT from Harry Hemond, Chairman, Radiation Protection Committee, 09/27/95 +
 - NOT IN BOX 2/26/97 RLB* r. Intake evaluation by Joseph Ring, Radiation Protection Services, Groton, MA, 09/29/95 ##
 - NOT IN BOX 2/26/97 RLB* s. Report of dose assessment by Joseph Ring, Radiation Protection Services, Groton, MA, 10/15/95 ##
 - NOT IN BOX 2/26/97 RLB* t. Dr. Li's lab notebook, 08/13/95 ##

✓ 15. Whole Body Counter Spectrum of Background, 10/18/95.

✓ 16. Whole Body Counter Spectrum from Subject, 10/18/95.

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- + = Proprietary Information - Not to be released

January 21, 1997 4:59pm

- ✓ 17. Printout showing times and dates of whole body counts on subject.
- MIT IN BOX
01/19/97 #18. Copy of whole body counter log showing dates and results of subject and phantom counts.
- ✓ 19. Receipt records for P-32 in Tonegawa Laboratory from June 1 through August 19, 1995.
- ✓ 22. Dr. Li's Urinalysis Activity Calculation Summary, 08/26-10/04/95 -- MIT Radiation Protection Office document.
- ✓ 23. Dr. Li's Urinalysis LSC Counter Results -- 08/21-10/12/95, MIT Radiation Protection Office document. #
- MIT IN BOX
01/19/97 #24. Dr. Li's Whole Body Count - Activity Assessment -- 08/18-10/11/95, MIT Radiation Protection Office document. ##
- ✓ 25. MIT P-32 Calibration Curve for LSC.
- ✓ 26. MIT Radiation Protection Office Data for P-32 Calibration of Whole Body Counter, 08/22/95.
- ✓ 27. MIT Radiation Protection Office Urinalysis Bioassay Procedures.
- ✓ 28. MIT Radiation Protection Office Standard Forms for Laboratory Surveys and Records.
- ✓ 29. MIT Radiation Protection Office Package Receipt Procedures, 11/04/94.
- ✓ 30. MIT Medical Department - Contaminated Patient Guidelines.
- ✓ 31. * 3 Folders ACB 9/18/97 MIT Folder "Required Procedures for Radiation Protection." Note: Folder contains information and procedures that RAM users are to follow, including Section G - Lab Surveys; Section H - Security; and Section N - Emergency Response.
- ✓ 32. B Transcript: Interview of Mitchell S. Galanek, Associate RSO, MIT, 10/18/95.

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- ✓ 33.B Transcript: Interview of Dennis King, Lab Manager, MIT, 10/18/95.
- ✓ 34. Estimate of Usage of P-32 Handwritten Note by Dennis King, 09/01/95.
- ✓ 35. Radiation Safety Training Records for Tonegawa Lab Employees.
- ✓ 36. Radiation Safety Training Syllabus.
- ✓ 37. Minutes of the 117th Meeting of the Radiation Protection Committee on September 12, 1995.
- ✓ 38. *X 2 copies 2/28/97 ACB* Whole Body Counter Spectrum of Calibration Sources in Phantom.
- ✓ 39. Subject Whole Body Count -- 09/22/95.
- ✓ 40. Subject Whole Body Count with Background Subtracted -- 09/22/95.
- ✓ 42. Diagram - Floor layout of Dr. Tonegawa's lab showing locations of his work area, RAM refrigerator, and cold <food> refrigerator.
- ✓ 43. Documents describing physical and chemical form of the material used by the researcher, specific activity, form, and size of container.
- ✓ 44.B Transcript: Interview with Dr. Yuqing Li, Researcher, MIT, 10/18/95.
- ✓ 45.B Transcript: Interview with Robert K. Burgess, Counting Room Technician, MIT, 10/18/95.
- ✓ 46. Background Spectrum with Gregory Gonceonto in the whole body counter chair, 10/19/95.
- ✓ 47. Published study of the MIT Whole Body Counter, Volume 19.
- ✓ 48. Memo to Frank Masse, MIT from John Glenn, NRC, 10/20/95 -- OFFICIAL POSITION OF MASSACHUSETTS INSTITUTE OF TECHNOLOGY ON DECISION NOT TO REPORT PHOSPHORUS-32 (P-32) CONTAMINATION.

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- ✓ 49.B Transcript: Interview of Mitchell S. Galanek, Associate RSO, MIT, 10/19/95.
- ✓ 50.B Transcript: Interview of Takuji Iwasato, Researcher, MIT, 10/19/95.
- ✓ 51.B Transcript: Interview of Hayden M. Prosser, Researcher, MIT, 10/19/95.
- ✓ 52.B Transcript: Interview of Dr. Yuqing Li, Researcher, MIT, 10/19/95.
- ✓ 53.B Transcript: Interview of Zhuo Qian, Researcher, MIT, 10/19/95.
- ✓ 54.B Transcript: Interview of Jie Shen, Researcher, MIT, 10/19/95.
- ✓ 55. Synopsis of MIT Enforcement History, License Number 20-01537-02 from John Kinneman, NRC Region I.
- ✓ 56. Memorandum to Chairman Jackson and Commissioner Rogers, from James Taylor, NRC, 10/20/95 -- MODIFICATIONS TO THE ONGOING INVESTIGATION AT MIT CANCER RESEARCH CENTER.
- NOT IN BOX 10/8/97 RCB
✓ 57. Documents provided by Captain John E. Driscoll, MIT Campus Police, 10/17/95.**
- a. MIT Campus Police Report, Incident Number 95008306, 08/19/95.**
 - b. Tonegawa Lab Isotope Inventory/Distribution Plan, 09/01/95.**
 - c. Fax to Lieutenant David McCoy, MIT Campus Police from Yuqing Li, MIT, 09/06/95 -- DETAILED INFORMATION ABOUT THE POISONING INCIDENT.**
 - d. Note to File from Donald Haes, Assistant Radiation Protection Officer, 09/12/95 -- PROFESSOR TONEGAWA LAB P-32 INVENTORY ASSESSMENT.**
 - e. Fax to David McCoy, MIT Camps Police from Dennis King, Lab Manager, 09/26/95 -- LIST OF LAB NUMBERS.**
 - f. Dr. Li's log book, 08/13-19/95.**
 - g. Letter to Anne Glavin, Chief, MIT Campus Police from Harry Hemond, Chairman, Radiation Protection Committee, 09/26/95 with attachment of letter to Dr. Yuqing Li, MIT from Harry Hemond, 09/27/95 regarding radioactive contamination.**

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= Personal Information - Not to be released

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ALB

- h. Science article entitled, "Deliberate Poisoning at NIH?," 07/28/95.
- i. TechMail for Windows message from Ken Campbell to John Driscoll, 10/17/95 -- NEWS RELEASE.**
- j. MIT News article entitled, "MIT Probing How Researcher was Contaminated in Laboratory," 10/16/95.
- k. MIT Campus Police Incident List (Computer Dump), 08/30/95.**

58. B Transcript: Interview of Dr. Yuqing Li, Researcher, MIT, 10/20/95.

59. B Transcript: Interview of Frank Masse, Radiation Safety Officer, MIT, 10/20/95.

60. B Transcript: Interview of Donald L. Haes, Jr., Assistant Radiation Safety Officer, MIT, 10/20/95.

61. B Transcript: Interview of Dr. Susumu Tonegawa, Professor of Biology, MIT, 10/20/95 (Transcription tape included).

✓ 62. Memorandum to James Taylor from Chairman Jackson, NRC, 10/13/95 -- NIH INCIDENT: FOLLOW-UP REGULATORY ACTIONS.

✓ 63. MIT Enforcement History, 1988-1995.

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BOX 28347
ALB
✓ 64. Preliminary Sequence of Events, 10/22/95.*

✓ 65. B Transcript: Interview of Shu Ying Huang, Technical Associate, MIT, 10/20/95.

✓ 66. Preliminary Notification PNO-IIT-95-02. STATUS REPORT FROM NRC INCIDENT INVESTIGATION TEAM, 10/20/95.

✓ 67. B Transcript: Interview of John Murray, Officer, MIT Campus Police, 10/22/95.

NOT IN
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ALB
✓ 69. Fax to Cherie Siegel, IIT Team from Harriet Karagiannis, AEOD, 10/23/95 -- EVENTS RELATED TO MIT CASE FOR IIT'S INFORMATION FROM 07/29/81 THROUGH 06/28/95.

✓ 70. Procedure for EMS Response to Emergencies, July 1994.

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+ = Proprietary Information - Not to be released

- ✓ 71. Hazardous Materials Training and Response Policy, MIT Campus Police, 08/03/93.
- ✓ 72. Direct DPM -- "Defining a DPM Assay."
- ✓ 73. Application for Authorization to Possess and Use Radioactive Material, Susumu Tonegawa, MIT, dated 05/30/95.
- ✓ 74. Record of Waste Picked Up from Professor Tonegawa in August, dated 08/14-18/95 and 08/21-25/95.
- ✓ 75. D. Haes Plots -- Proceedings of ICRP-30 Results of Y. Li P-32 Intake, Corrected to 08/14/95. #
- ✓ 76. D. Haes Rad Level "Body Map" of Y. Li -- Dose Rate Readings (mR/hr), 08/19/95.
- ✓ 78. Duties and Responsibilities of the Radiation Protection Committee.
- ✓ 79. Written Expectations Regarding Handling of RAM Issued by Radiation Protection Committee.

81. Photos

- x a. Phantom -- 3 pieces, open, separate, on floor.
- ✓ b. Phantom -- in chair with chair open.
- [x c. Phantom -- in chair with chair closed.
- [x d. Whole body counter -- empty.
- [x e. Whole body counter -- with person.
- [x f. Dr. Li's lab area.
- g. Radiation material storage freezer/refrigerator.
- x h. Radiation material storage freezer, open, showing locked storage box.
- ✓ i. Entrance to Center for Cancer Research.
- [x j. Combi-vial showing dimension.
- [x k. Pipetter.
- [x l. Plexiglass shield for P-32 work (Dr. Li's shield).
- [x m. General lab photos.
 - 1. Radiation lab.

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08/21/95
H/28/95

2. Waste containers.
3. Centrifuges.
4. Lab hood.
5. Packard LSC.
6. Urine specimens.

✓ 82. Record of Analysis of Blood Sample Drawn from Dr. Li. 08/21/95.

NOT IN BOX
2/28/95

✓ 83. Records of Urinalysis Performed on other Employees in Tonegawa's Lab, 08/22/95.##

✓ 84. Meeting Minutes of the Radiation Protection Committee, 01/22/92 through 08/23/95.

✓ 85. *LISTED AS M.I.T. RAD. PROTECT. OFF. 6/15/95 (SEE ATT. 5/1995)*
Radiation Safety Office Audits of Tonegawa's Lab -- July 1990 to Present.

✓ 86. Request for any written record or note showing initial dose estimate based on first urine specimen and total body fluid volume for Dr. Li by J. Glenn, IIT, 10/23/95.

NOT IN BOX
10/28/95

✓ 87. MIT Materials License, Number 20-01537-02, dated March 23, 1995. +

✓ 88. Additional Guidance for Interviewee/Transcript Reviewer, 10/24/95.

✓ 89. Transcript: Interview of William Irwin, Assistant Radiation Protection Officer, MIT, 10/23/95.

✓ 90. Transcript: Interview of Dr. Robert J. McCunney, Director, Environmental Medicine, MIT, 10/23/95.

✓ 91. Transcript: Interview of Jacquelyn Yanch, Associate Professor of Nuclear Engineering and Whittaker College of Health Sciences and Technology, MIT, 10/23/95.

✓ 92. Transcript: Interview of Dr. Joseph Ring, Health Physicist, Harvard Radiation Protection Office, Harvard, 10/23/95.

✓ 93. Transcript: Interview of Peter Dedon, Assistant Professor of Toxicology, MIT, 10/23/95.

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10-45-85

✓ LISTED ON SHEET AS
* 85. RAD. SAFETY OFF. RADIATION CONTROL

M.I.T. RADIATION PROTECTION OFFICE

GROUP RETRAINING SESSION HELD ON 6/15/95 @ 16:30

I. Identification of Authorization # CC12 m :

Project Supervisor: S. TANEKAWA

Department: CC12

Radionuclide	Possession Limit	Activity Used per Experiment (Maximum)	Physical/ Chemical Form	Current Possession Limit
^{32}P	40mCi	1mCi	NUCLEOSIDES	40mCi
^{125}I	80mCi	4-6mCi	NaI	80mCi
^3H	20mCi	2mCi	NUCLEOTIDES	20mCi
^{14}C	1mCi	100μCi	AMINO ACIDS	1mCi
^{35}S	60mCi	10mCi	NUCLEOTIDES	60mCi
^{51}Cr	15mCi	2mCi	SODIUM CHROMATE	15mCi

II. Information For Project Review:

A. Authorization, Section I:

1. Possession Limits.
2. Authorized Users.
3. Registered Laboratories.
4. Principal Procedures.
5. Radiation Protection Equipment.
6. Waste Disposal.


B. Authorization, Section II:

1. Specific Conditions of Approval:
2. Standard Conditions of Approval:

III. Miscellaneous Information.

IV. Signatures.


RPO Staff Member


Project Supervisor

January 21, 1997 4:59pm

- ✓ 94.B Transcript: Interview of Kevin Wentzel, Assistant Professor, Nuclear Engineering Department, MIT, 10/23/95.
- ✓ 95.B Transcript: Interview of Harold F. Hemond, Professor of Civil and Environmental Engineering, MIT, 10/23/95.
- ✓ 96.B Transcript: Interview of Geoffrey Sirr, Tech A, MIT, 10/23/95.
- ✓ 97.B Transcript: Interview of Juan LaFaille, Post Doctorate and Associate, Tonegawa's Lab, MIT, 10/23/95.
- ✓ 98.B Transcript: Interview of Dr. David E. Housman, Professor of Biology, MIT, 10/23/95.
- ✓ 99. Memorandum to Guy Caputo, Director, Office of Investigations, NRC from Edward Jordan, Director, AEOD, NRC, 10/23/95 -- AVAILABILITY OF RECORDS COLLECTED AND MAINTAINED BY THE MIT INCIDENT INVESTIGATION TEAM (IIT).
- ✓ 100. Press Release from NRC Region I Office of Public Affairs -- NRC TO HOLD MEETING IN BOSTON TO DISCUSS INVESTIGATION INTO THE INGESTION OF RADIOACTIVE MATERIAL BY MIT RESEARCHER, 10/24/95.
- ✓ 101. Urine Sample Data and Analysis provided by the Contaminated Individual, 09/13 to 10/11/95.
- NOT ON LIST
12/28/97 X 102. Analysis of the Licensee's Whole Body Counter Data provided by the Contaminated Individual, 08/19 to 10/18/95.##
- ✓ 103. Reference on Internal Contamination Investigation Levels provided by the Contaminated Individual, 10/23/95.
- NOT ON LIST
12/28/97 X 104. Curve Fitting Data for Urine Samples provided by the Contaminated Individual, 10/23/95.##
- NOT ON LIST
12/28/97 X 105. Curve Fitting for Urine Data, provided by the Contaminated Individual, 10/23/95.#

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106. Phosphorus Metabolic Data provided by the Contaminated Individual, 10/23/95.##

✓ 107. Records of any suspensions or probations imposed on Tonegawa's lab since July 1990; dated 12/22/93 and 03/06/94.

✓ 108. Records of contamination incidents report in the Cancer Center to Radiation Safety Office since July 1990, dated 07/22/94, 04/12/95, and 06/27/95.

✓ 109. Resumes of Radiation Safety Office Staff. #

✓ a.	Frank Masse	✓ b.	Mitchell S. Galanek
✓ c.	William E. Irwin	✓ d.	Judith M. Reilly
✓ e.	Thomas P. Fuller	✓ f.	Donald L. Haes
✓ g.	Deying Sun	✓ h.	Geoffrey Sirt
✓ i.	Scott McLaughlin	✓ j.	Kevin White
✓ l.	Robert Burgess	✓ m.	William Prescott
✓ n.	Steven Greenlaw		

✓ 110. Response to questions from IIT.

✓ 112. Letter to Thomas Martin, NRC from J.D. Litster, MIT, 10/24/95, RESPONSE TO NRC'S 10/17/95 LETTER.

✓ 113. Preliminary Notification PNO-IIT-95-03, STATUS REPORT FROM NRC INCIDENT INVESTIGATION TEAM, 10/25/95.

✓ 114. Memorandum to John Glenn, NRC from Frank Masse, MIT, 10/23/95 -- RESPONSE TO YOUR MEMO ON 10/20/95.

✓ 115. Exit Meeting Sign-in Sheet, 10/25/95.

✓ 117B Exit Meeting Transcript, 10/25/95.

✓ 133. NRC Inspection Manual, Chapter 2800, MATERIALS INSPECTION PROGRAM, 04/17/95.

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- ✓ 154. Draft Regulatory Guide DG-0005 (Second Proposed Revision 2 to Regulatory Guide 10.5), APPLICATIONS FOR LICENSES OF BROAD SCOPE, October 1994.
- ✓ 157. Regulatory Guide 10.5 (Revision 3), STANDARD REVIEW PLAN FOR APPLICATIONS FOR LICENSES OF BROAD SCOPE, June 1994.
- ✓ 160. Regulatory Guide 10.5 (Revision 1), APPLICATIONS FOR TYPE A LICENSES OF BROAD SCOPE, December 1980.
- ✓ 161. 10 CFR Part 20 Reporting Requirements, undated.
- ✓ 163. Draft Regulatory Guide and Value/Impact Statement -- Proposed Revision 2 to Regulatory Guide 10.5, February 1989.
- NOT IN BOX
164. Transcript: Initial Conference Call to Headquarters Operations Center, 10/16/95 (transcribed from HOO tape).*
- ✓ 171. Transcript: Interview of Dr. Carl J. Paperiello, Director, Office of Nuclear Materials, Safety and Safeguards, NRC, 10/31/95.
- ✓ F172. Transcript: Interview of James Dwyer, Senior Health Physicist, Medical Inspection Branch, Region I, NRC, 10/31/95.
- NOT IN BOX
F175. Transcript: Interview of Dr. Donald A. Cool, Director, Division of Industrial and Medical Nuclear Safety, NMSS, NRC, 11/01/95. +
- NOT IN BOX
F176. Transcript: Interview of Donna-Beth Howe, Health Physicist, Medical, Academic and Commercial Safety Branch, NMSS, NRC, 11/01/95. +
- NOT IN BOX
F180. Preliminary Notification 78-25, CONTAMINATION INCIDENT, including a memorandum for H.E. Book's Personal File from H.E. Book, Chief, Fuel Facility and Materials Safety Branch, Region V, NRC -- RADIATION INCIDENT AT UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL IN SAN FRANCISCO, 12/08/78. +

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- ✓ 181. Preliminary Notification 78-35, CONTAMINATION INCIDENT, including a preliminary report -- PRELIMINARY PHOSPHOROUS-32 INTERNAL CONTAMINATION REPORT, 12/13/78. +
- ✓ 182. Listing of Subject Titles and Dates of all Information Notices issued by the NRC.
- ✓ 183. Basic Event Information Reports sent by V. Dricks, OPA/Region I, NRC.
- ✓ 184. Transcript: Interview of Susan Frant Shankman, Deputy Director, Division of Nuclear Materials Safety, Region I, NRC, 11/02/95.
- NOT IN BOX
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- ✓ 185. Fax from the Atomic Energy Control Board, Ottawa, Canada, to William Upshaw, IP/NRC, 11/03/95 -- CANADIAN P-32 INCIDENT. +
- ✓ 187. States Agreement Memo from Richard Bangart, Director, Office of State Programs, 10/30/95 -- TRANSMITTAL OF STATE AGREEMENT PROGRAM INFORMATION (SP-95-17) including NRC Information Notice 95-51: RECENT INCIDENTS INVOLVING POTENTIAL LOSS OF CONTROL OF LICENSED MATERIAL, 10/27/95.
- ✓ 188. Letter to Cecil Brown, Chief, Radioactive Materials Section, North Carolina Department of Environment, Health, and Natural Resources from Davis Jorgensen, Duke University Medical Center -- RADIATION INCIDENT REPORT, 02/21/90 (cross reference 10-95-195). #
- ✓ 189. Note to Janet Schlueter, NMSS/NRC from Harriet Karagiannis, AEOD/NRC -- REQUEST FOR INFORMATION ON DATA INVOLVING P-32 CONTAMINATION, 07/25/95, including Basic Event Information Reports. (Note: Cross Reference with 10-95-183).
- ✓ 190. Note to Stu Rubin, AEOD/NRC from Pat Baranowsky, AEOD/NRC -- MEDICAL EVENTS RELATED TO THE NIH AND MIT EVENTS, 10/19/95.
- ✓ 191. Additional Information regarding the CANADIAN P-32 INCIDENT, received 11/03/95.

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✓ 192. NRC Information Notice 89-35: LOSS AND THEFT OF UNSECURED LICENSED MATERIAL, 03/30/89.

✓ 193. Memorandum to John Glenn, Chief, Radiation Protection and Health Effects Branch, RES/NRC, 11/02/95 -- TRIP REPORT-MIT.

✓ 195. Radiation Incident Report at Duke University that occurred on or about 04/16/88 (redacted version included - cross reference 10-95-188). #

✓ 196. Radiation Incident Report at Brown University on 02/05/82.

✓ 197. AEOD Procedure 3.3 -- SCREENING OF OPERATIONAL DATA AND INFORMATION NONREACTOR REPORTS.

✓ 198. Transcript: Interview of Harriet Karagiannis, Senior Project Manager, AEOD/NRC and Sam Pettijohn, Data Analyst, AEOD/NRC, 11/06/95.

✓ 199. Transcript: Interview of Patrick Baranowsky, Branch Chief, Reliability and Risk Assessment Branch, AEOD/NRC, 11/06/95.

✓ 200. Transcript: Interview of Richard Bangart, Director, Office of State Programs, NRC and Paul Lohaus, Deputy Director, Office of State Programs, NRC, 11/06/95.

✓ 201. Transcript: Interview of Joel Lubenau, Senior Health Physicist, NMSS/NRC, 11/07/95.

✓ 202. Briefing packages and reports of NMSS monthly Operational Events Briefings for 1988.

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✓ 203. Fax to Cherie Siegel, NRC from Roy Collins, Atomic Energy Control Board, Canada, 11/08/95, ANALYSES RESULTS OF CANADIAN P-32 EVENT, INCLUDING WHOLE BODY COUNT.##

✓ 204. Preliminary Notifications: PNO-I-88-24 (dated 03/03/88); PNO-I-88-24A (dated 03/1988); PNO-I-88-24B (dated 03/14/88) -- WORKER DIGESTION OF P-32 AT ALBERT EINSTEIN MEDICAL CENTER, NEW YORK CITY.

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- ✓ 205. NMSS Briefing Sheet -- Operational Events Briefing, 07/01/91.
- NOT IN FILE
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✓ 207. Note to E. Ullrich, IIT/NRC from M. Galanek, MIT dated 11/08/95 -- P-32 STOCK VIALS AND MIT RECEIPT LOG.
- ✓ 208. Copies of records for radioisotope inventories, receipts, and disposals maintained by Dennis King, Lab Manager, MIT -- July 1992 to present.
- ✓ 210. American Association of Poison Control Center -- INTENTIONAL RADIOSCOPE EXPOSURES, 1983-1994.
- ✓ 211. Letter to David J. Litster, MIT from Thomas Martin, Regional Administrator, Region I/NRC -- CONFIRMATORY ACTION LETTER -- SUPPLEMENT 1, 10/27/95.
- NOT IN FILE
2/28/97
✓ 213. Fax to John Glenn, IIT from Dr. Daniel Flynn, Lowell General Hospital -- PRELIMINARY CONSULTANT'S REPORT, 11/10/95.*
- ✓ 216. Letter to James Taylor, NRC from K. Mulholland, Veterans Administration, Bronx, New York -- RESPONSE LETTER INVOLVING EXCESSIVE EXPOSURE OF A RESEARCH WORKER TO IODINE-125, dated 04/12/85.
- NOT IN FILE
2/28/97
✓ 217. Fax to Elizabeth Ullrich from M. Laudeman, Oak Ridge Institute for Science and Education (ORISE) -- PRELIMINARY URINE SAMPLE ANALYSES RESULTS, 11/22/95.*
- ✓ 218. Appendices to Analysis of Urine and Whole Body Data by Lawrence Livermore National Laboratory, 11/17/95.##
- ✓ 219. Medical Consultant Report dated 11/25/95.##
- ✓ 220. EDO Briefing Slides -- MIT IIT FINDINGS AND CONCLUSIONS, 11/29/95.
- ✓ 221. Transcript: Final Exit of Incident Investigation Team (with tapes), 12/8/95.

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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

October 17, 1995

MEMORANDUM TO: Chairman Jackson
Commissioner Rogers

FROM: James M. Taylor *James M. Taylor*
Executive Director for Operations

SUBJECT: INVESTIGATION OF A PHOSPHOROUS-32 INTERNAL
CONTAMINATION AT THE CANCER RESEARCH CENTER,
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON,
MASSACHUSETTS

On Monday, October 16, 1995 at 10:15 a.m., the Radiation Safety Officer (RSO) for the Massachusetts Institute of Technology (MIT) informed Region I that on August 19, 1995 a male researcher at a laboratory in the MIT Cancer Research Center was found to have had an uptake of phosphorus-32 (P-32). The researcher discovered the uptake during a routine closeout survey of his work area on Saturday evening, August 19, 1995. The researcher concluded that the high background radiation in the laboratory was being caused by his internal radioactive contamination.

MIT radiation safety officials initiated surveys later in the evening on August 19, 1995 of the laboratory work areas, the individual's home and his family members with negative results. Urine samples and whole body counting of the contaminated individual and articles of clothing were also initiated. The licensee believes that the researcher was internally contaminated on August 14, 1995. Other personnel in the laboratory were evaluated for contamination on Monday, August 21, 1995 with negative results. The licensee has accounted for all P-32 material except for about 500 microcuries based on an inventory and records of its use in the laboratory.

Analysis of urine and samples over a six-week period and whole-body scans conducted by the licensee has led the licensee to conclude the individual's uptake had been a maximum of 579 microcuries. At the individual's request, an outside expert is reviewing the data and licensee assessment to determine whether appropriate samples were taken, if analyses were done correctly, and whether the assessment is reasonable. The licensee has provided NRC with a copy of the report of their assessment which was released to the contaminated individual during the week of October 9, 1995. A copy of the report from the outside expert will be provided to NRC Region I as soon as it is received by MIT.

The individual also reported the internal contamination to the MIT Campus Police and alleged that the contamination could not be explained by normal handling. The Campus police are reviewing the information. MIT will issue a press release.

Because the incident involves circumstances which are not well enough understood, and involves characteristics, the investigation of which would best serve the needs and interests of the Commission, I have requested AEOD to establish an NRC Incident Investigation Team (IIT). The IIT is to: (a) fact-find as to what happened, (b) identify the probable cause or causes as to why it happened, and (c) make appropriate findings and conclusions which would form the basis for any necessary follow-on actions. The IIT charter is attached. Based on the initial assessment by the team, it is possible that the investigation could be downgraded to an AIT.

The team will report directly to me and is comprised of: John Glenn (RES), IIT Leader; Larry Robinson (Office of Investigations, Region II); Elizabeth Ullrich (Region I); Sami Sherbini (NMSS); and Alan Madison (AEOD). Contractor support will provide additional technical expertise, as necessary. Because of the limited number of technical experts able to investigate an event of this type, some team members have had previous inspection involvement at the facility. The IIT was selected on the bases of their knowledge and experience in the fields of medical physics, health physics, laboratory radiation safety procedures and investigations. All team members are relieved of all normal duties while assigned to the IIT.

The Commonwealth of Massachusetts has been notified of the event. NRC Region I and the Office of Public Affairs are prepared to respond to media interest. NRC Region I initiated an immediate inspection at MIT to follow-up on the licensee's actions in assessing this contamination event. This inspection has been subsumed by this IIT. Region I remains responsible for any enforcement or other actions resulting from this investigation.

The licensee has agreed to preserve the biological samples taken from the contaminated individual until the team has had an opportunity to evaluate the event. The licensee's actions have been confirmed by the Region in a Confirmatory Action Letter which was issued on October 17, 1995.

The IIT report will constitute the single NRC fact-finding investigation report. It is expected that the IIT report will be issued within about 45 days from the time the team exits from the site.

Attachment: As stated

cc w/encl:

SECY

OCG

ACRS

OPA

OSP

Regional Administrators

Incident Investigation Team Charter

PHOSPHOROUS-32 INTERNAL CONTAMINATION AT THE CANCER RESEARCH CENTER, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, MASSACHUSETTS

The scope of the investigation should include: incident chronology; source of the P-32 and contamination characterization; analysis of actual and potential dose consequences; radiation safety program; event reporting and licensee response; an evaluation of potential wrongdoing at the center; and whether the NRC's regulatory process and activities preceding the event contributed to it. Within the framework of this overall scope the IIT should specifically:

With respect to the incident chronology; develop a probable sequence of events associated with the P-32 internal contamination including its probable source; handling and movement within the center; and ingestion circumstances.

With respect to the P-32 source and contamination characterization: determine the quantity and chemical form of the radioactive material ingested, whether any other individuals were contaminated, and any external contamination associated with the event.

With respect to analysis of the actual and potential dose consequences: evaluate the intake and the resulting internal dose received by the researcher (and any others who may have been contaminated) as a result of the ingestion or external contamination, and the potential health consequences, (if any); and assess exposures (if any) to any other individuals who were associated with the center from the time of discovery of the cancer researcher's internal contamination.

With respect to the radiation safety program: evaluate the licensee's program at the center for P-32 including material accounting; controlling access and use; evaluate the use of surveys for detecting contaminations and procedures for responding to P-32 contaminations.

With respect to event reporting and licensee response evaluate the actions taken by the licensee to: report the contamination to the NRC; assess contamination of individual(s) including medical followup and mitigation treatments; assess the extent of any other associated contaminations at the center and offsite; and prevent additional similar events. Provide input to Region I to evaluate continued operations of the center.

With respect to potential wrongdoing at the center: evaluate whether and the nature of any intentional actions by one or more individuals to cause the contamination.

With respect to the NRC's regulatory process and activities: evaluate the regulatory controls concerning this type of event.

Attachment

-1-

October 16, 1995

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE PNO-I-95-044

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by Region I staff in King of Prussia, Pennsylvania on this date.

Facility	Licensee Emergency Classification
Massachusetts Institute Of Technology	Motification of Unusual Event
Mit	Alert
77 Massachusetts Avenue	Site Area Emergency
Cambridge, Massachusetts 02139	General Emergency
Dockets: 03000763 License No: 20-01537-02	X Not Applicable

Subject: UPTAKE OF 579 MICROCURIES OF PHOSPHORUS-32 BY AN INDIVIDUAL

On Monday, October 16, 1995 at 10:15 a.m., the licensee informed the Region I Office of an uptake of 579 microcuries of phosphorus-32 (P-32) by a male researcher at the Massachusetts Institute of Technology (MIT) that was discovered on August 19, 1995. The individual had worked with P-32 only on August 14 and August 19 of that week and discovered that he was contaminated during a routine survey of his work area on August 19. The individual noted that there was an unusually high background in the laboratory which made it difficult to perform his close-out survey at the end of that work day. In attempting to discover why the laboratory background was high, he determined that his internal radioactive contamination was the cause.

The MIT Radiation Safety Office began their response to the contamination event on August 19 with surveys of the work area and of the individual's home. No contamination was identified in the individual's home and no unusual contamination was found in the work area. On Monday, August 21, the individual brought his clothing, worn during the previous week and cataloged by wear day, for survey at MIT. The MIT Radiation Safety Office identified P-32 contamination on an item of underwear worn August 14, and thus, believe this is the best estimate for the date of the intake.

The MIT Radiation Safety Office has accumulated 6 weeks of urinalyses and whole-body scans to determine the individual's uptake and have assessed the intake to be a maximum of 579 microcuries. At the individual's request, an outside expert is reviewing the data and assessment to verify if appropriate samples were taken, if analyses were done correctly, and to determine if the assessment is realistic. The MIT Radiation Safety Office has provided to NRC a copy of the report of the assessment released to the individual during the week of October 9. A copy of the report from the outside expert will be provided to the NRC Region I Office as soon as it is received by MIT.

The individual has reported the contamination to the MIT Campus Police, who are reviewing the information. The MIT Radiation Safety Office did

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ot report the contamination incident to NRC sooner because they believe it does not meet the required reporting criteria. The magazine Nature has contacted them for information about the event. MIT will issue a press release.

When the contamination incident was discovered, the MIT Radiation Safety Office confiscated all radioactive material in the laboratory in order to do a complete inventory and to remove any possible additional contamination. Based on incoming orders and records of use of radioactive material in the laboratory, they determined that all material was accounted for except for approximately 500 microcuries of P-32. Surveys and bioassays identified no additional contamination.

The MIT Radiation Safety Office allowed work with radioactive materials to resume in early September in the laboratory where the contamination event occurred. The contaminated individual has returned to work but was requested to do no work with radioactive material indefinitely. In addition, the Radiation Safety Office has required more stringent inventory and accountability of radioactive materials in this laboratory and has increased oversight there.

The Commonwealth of Massachusetts has been notified of the contamination event. The Region I Office of Public Affairs is prepared to respond to media interest. NRC Region I plans an immediate inspection at MIT to follow-up on the licensee's actions to assess this contamination event. This PM was read to the licensee over the telephone and was correct as of 4:30 p.m. on October 16, 1995.

Contact: J. Kinneman
(610)337-5252