



**Princeton University
Environmental Health and Safety**

February 26, 2007

Mr. James Dwyer
Chief, Commercial and R&D Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia
Pennsylvania 19406-1415

Re: License Number 29-05185-24

Dear Mr. Dwyer:

On December 14, 2006, on behalf of Princeton University, I submitted a written report to you regarding the occurrence of a leaking Sr-90 source. At the time the report was submitted, I was still awaiting the results of a bioassay performed for Researcher A (as defined in Attachment A to the December 14 report), and I indicated that I would provide the bioassay results, once they were available, as a supplement to the December 14 report.

We have received the bioassay report provided by Radiation Safety Associates, and the report is attached to this letter as Attachment A. To summarize, the results for strontium-90 analysis in the urine sample provided by Researcher A are indistinguishable from background.

We note that all areas or items that were contaminated as a result of the leaking source have either been decontaminated or have been disposed of as radioactive waste. For instance, EHS staff made an effort to decontaminate the two undamaged Sr-90 sources (ID Numbers PHY-0026 and PHY-0028) that had been stored with the damaged source, but ultimately decided that decontamination of the sources would not be possible without great effort and unwarranted radiation exposure. Those sources have been placed into radioactive waste storage containers pending final disposal.

As indicated in the December 14, a variety of corrective measures are underway, including a review to identify aged and potentially vulnerable sources. For example, Physics Department researchers have recently met and agreed to the disposal of a variety of older sources.

Please direct any questions concerning this report to me at (609) 258-6252.

Sincerely,

Sue M. Dupre
Radiation Safety Officer

SMD/smd

Attachment as indicated below:
Attachment A: RSA Laboratories Bioassay Report

2007 MAR - 1 PM 1:06
RECEIVED
REGION I

C: Dennis Lawyer, Nuclear Regulatory Commission
Garth Walters, Director of Environmental Health & Safety
Prof. Elizabeth Gavis, Radiation Safety Committee Chair
Prof. A. J. Stewart Smith, Dean for Research
Laurel Harvey, General Manager for Administration and Compliance
Prof. Kirk McDonald, Professor of Physics
Dr. Changguo Lu, Detector Physicist
Dr. Paul LaMarche, Physics Department Manager
Prof. Daniel Marlowe, Physics Department Chairperson
Stephen Elwood, Health & Safety Specialist
Mr. William Czaszar, NJ Department of Environmental Protection
File 9.1
File 8.3
Departmental File – Physics (d-1)



RSA Laboratories

A DIVISION OF RADIATION SAFETY ASSOCIATES, INC.

15 February, 2007

Sue Dupre
Princeton University
Office of Environmental Health & Safety
262 Alexander St.
Princeton, NJ 08544

Dear Dr. Dupre:

As you can see from the results e-mailed to you on 15 Feb 2007, the results for strontium-90 analysis in the 24 hour urine you supplied are indistinguishable from background.

I originally stated that I would be utilizing EPA Method 905.0 to analyze for strontium 90 in your sample. This procedure involves spiking the sample with non-radioactive strontium and barium carriers followed by a carbonate precipitation. Radioactive isotopes of strontium and radium are co-precipitated with the non-radioactive carriers as a carbonate precipitate. This initial precipitation is followed by separation of the strontium from the radium and subsequent analysis of either strontium 90, or its daughter yttrium 90, by gas proportional counting. Unfortunately, the chemical complexity of the urine sample resulted in the formation an abnormally large carbonate precipitate. It was not possible to separate the strontium and barium carriers from this precipitate.

At this point I sought out another procedure by which to analyze the sample for strontium 90. I chose a procedure that utilized an ion exchange column to selectively separate strontium from the sample. The carbonate precipitate from the EPA 905.0 was re-dissolved in De-ionized water and brought to a volume of 1.0L.

A 250ml fraction was removed and put through Eichrom procedure SRU01-05. This involved co-precipitating the strontium carrier in the sample with calcium, re-dissolving the resultant precipitate in 8N nitric acid and putting the resultant solution through the ion exchange column. After several 8N nitric acid washes which removed other contaminants, including yttrium 90, the column was capped and set aside for a period of 3 weeks to permit ingrowth of yttrium 90. After the ingrowth period, the yttrium-90 was

stripped from the column with 8N nitric acid. This was followed by elution of the strontium carrier and any associated strontium-90. The strontium and yttrium fractions were dried onto stainless steel planchets and counted on a gas proportional counter.

The strontium carrier recovery was monitored by weighing the planchet and calculating strontium recovery as SrNO_3 . Strontium carrier recovery was found to be 77%.

An additional aliquot of the sample was spiked with Strontium 90 and put through the same procedure. This was not intended to be a quantitative indication of strontium 90 recovery as this spike was carried out midway in the procedure and potential carrier losses had already occurred. Instead, this was intended to demonstrate that any radioactive strontium present in the original sample would have followed the non-radioactive carrier and been present in the final sample, and this it did.

If you have any questions, please do not hesitate to contact me.

Sincerely

A handwritten signature in black ink, appearing to read 'Jay R. Dockendorff', written in a cursive style.

Jay R. Dockendorff
Laboratory Director

RSA Laboratories
A Division of Radiation Safety Associates

Radiochemistry Analysis Data Sheet

COC #: 21355RR Rpt:23

Client: Princeton University

Client Samp. No.: [●] 24Hr

Location: Not Indicated

RSA Lab. Samp. No. 21737

Project: Sr-90 Direct count

Date Collected: Not Indicated


Sample Type: Urine

Date Received: 12/05/06

Matrix: Urine

State of Connecticut Laboratory Cert # : PH-0111

<u>Parameter</u>	<u>Method</u>	<u>Result</u>	<u>LLD</u>	<u>Units</u>	<u>Date</u>
Strontium 90	SRU01-05	0.18 +/- 0.82	1.45	pCi/L	01/23/07


Jay R. Dockendorff
Laboratory Director

RSA Laboratories
A Division of Radiation Safety Associates

Radiochemistry Analysis Data Sheet

COC #: 21355RR Rpt:22

Client: Princeton University

Client Samp. No.: [redacted]-24Hr

Location: Not Indicated

RSA Lab. Samp. No. 21737

Project: Sr-90 as Yttrium 90

Date Collected: Not Indicated

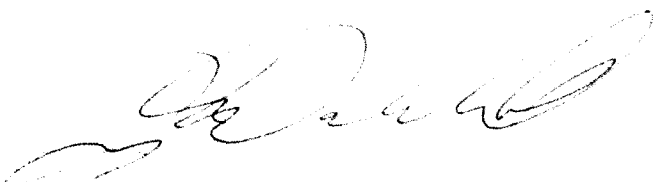
Sample Type: Urine

Date Received: 12/05/06

Matrix: Urine

State of Connecticut Laboratory Cert # : PH-0111

Parameter	Method	Result	LLD	Units	Date
Strontium 90	SRU01-05	0.08 +/- 1.96	3.48	pCi/L	01/23/07


Jay R. Dockendorff
Laboratory Director