To: Betsy Ulrich, NRC

From: Mitchell Galanek, MIT

Re: ^{32}P Stock Vials and MIT Receipt Log

Date: 11/8/95

Attached please find the receipt logs or packages delivered to the Tonnegawa laboratory from 8/7/95 through 8/19/95.

The following is the information requested on the two stock vials retrieved by Don Haes from the Tonnegawa laboratory:

Vial 1:

Assay date:	8/19/95
Specific Activity:	10 mCi/ml
Activity Shipped:	1 mCi in 0.1 ml
Compound:	α ^{32}P dCTP
Stock #	BLV/NEG/013H
Lot#	013H08105
Date received:	8/14/95

Vial 2:

Assay date:	8/12/95
Specific Activity:	10 mCi/ml
Activity Shipped:	1 mCi in 0.1 ml
Compound:	α ^{32}P dCTP
Stock #	BLV/NEG/013H
Lot#	013H08035
Date received:	8/07/95

Both shipments were delivered in the morning on the receipt dates.

RP-014
Rev. 7/95

M.I.T. RADIATION PROTECTION OFFICE
Check-In Record of Radioactive Material

P.O. #	ORDERED BY	LAB NO.	NUC-LIDE	mCi	SURFACE mR/HOUR	1 METER mR/HOUR	LABEL TYPE	WIPE TESTS dpm/100cm²	CHECKED BY	DATE	COMMENTS **
74021	Horwitz	E5433	P-32	.523	.10	<.05	VII	<MDA	GS	8.4.95	
568226	LAMANIAN	68-298	P-32	.687	.5	<.05	N/A	<MDA	MH	8/7/95	
591871	BRUNMARK	16 820	S-35	.636	<.05	<.05	N/A	<MDA	MH	8/7/95	
530332	SHAFBAR	26-027	S-35	3.817	<.05	<.05	N/A	<MDA	MH	8/7/95	
030F7005	TONEGAWA	E17-360	P-32	1.27	.5	<.05	WHITE 1	<MDA	MH	8/7/95	
594608	BARTHEL	68-653	P-32	.686	.2	<.05	N/A	<MDA	MH	8/7/95	
594068	FAYAD	26-007	S-35	10.9mC	.1	<.05	WHITE 1	<MDA	MH	8/7/95	
594958	PLOEGH	E17-323	P-32	1.27	<.05	<.05	WHITE 1	<MDA	MH	8/7/95	
568224	ZAMANIAN	68-298	P-32	.319	<.05	<.05	N/A	<MDA	MH	8/7/95	
594960	WEILER	68-495	P-32	.638	<.05	<.05	N/A	<MDA	MH	8/7/95	
030F70006	TONEGAWA	E17-360	P-32	1.27	.5	<.05	N/A	<MDA	MH	8/7/95	
567177	MARGARET	E17-221	I-125	.15mC	8 mR/h	.1	YELLOW 4	<MDA	MH	8/7/95	
577422	SARP	E17-528	P-32	.638	<.05	<.05	N/A	<MDA	MH	8/7/95	
507583	HOLZMACHER	68-541	S-35	15.27	<.05	<.05	N/A	<MDA	MH	8/7/95	
594625	Feddy	E17536	32P	1.817	0.70	<0.05	Y-11	SMDA	SM	8/8/95	
595337	Pedroza	E18561	32P	0.304	0.40	<0.05	N/A	SMDA	SM	8/8/95	
593004	Pedroza	E18561	32P	0.304	0.40	<0.05	N/A	SMDA	SM	8/8/95	
595345	LeCour	66647	14C	0.010	<0.05	<0.05	N/A	SMDA	SM	8/8/95	

* Notify the appropriate staff member if: (a) wipe test results exceed 2000 dpm/100 cm², (b) external radiation levels exceed 50 mrem/hr, or (c) radiation levels at 1 meter exceed 1 mrem/hr. Wipe test MDA = 1000 dpm/100 cm².

** Note discrepancies in labelling, packaging, or radiation and contamination levels.

RP-012
Rev. 7/95

M.I.T. RADIATION PROTECTION OFFICE
Check-In Record of Radioactive Material

P.O. #	ORDERED BY	LAB NO.	NUC-LIDE	mCi	SURFACE mR/HOUR	1 METER mR/HOUR	LABEL TYPE	WIPE TESTS dpm/100cm^2	CHECKED BY	DATE	COMMENTS **
830f96018	PABO	68564	^{32}P	0.738	0.2	<0.05	yellow II	<MDA	KW	8/11/95	
596316	WEILER	68495	^{32}P	0.738	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
596502	SONG	686940	^{32}P	2.94	0.07	<0.05	white I	<MDA	KW	8/11/95	
596486	SUEC	68395	^{3}H	1.0	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
553169	SMITH	68553	^{32}P	0.257	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
596488	SUEC	68395	^{35}S	1.028	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
577421	SHARP	E17529	^{35}S	0.322	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
596493	KAN	E18604	^{35}S	0.322	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
575365	DELANEY	K340	^{32}P	0.369	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
592648	MATHUR	K336	^{32}P	5.133	0.1	<0.05	white I	<MDA	KW	8/11/95	
596483	WILLET	68265	^{35}S	0.516	<0.05	<0.05	NONE	<MDA	KW	8/11/95	
453797	Plorde	P17323	35S	17.06	<0.05	<0.05	N/A	SMDA	SM	8/14/95	
596774	J. Lee	P17524	32P	0.950	<0.05	<0.05	WI	SMDA	SM	8/14/95	
577421	Chemistry	P17528	35S	0.315	<0.05	<0.05	N/A	SMDA	SM	8/14/95	
830F70006	Ferguson	P17506	32P	1.27	<0.05	<0.05	N/A	SMDA	SM	8/14/95	
596503	Kuzman	68489	35S	0.53	<0.05	<0.05	WI	SMDA	SM	8/14/95	
549625	Rodely	P17536	32P	2.54	1.0	<0.05	Y-II	SMDA	SM	8/14/95	
596771	House-Rothschild	68340A	35S	0.315	<0.05	<0.05	N/A	SMDA	SM	8/14/95	

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RP-012
Rev. 7/95

M.I.T. RADIATION PROTECTION OFFICE
Check-In Record of Radioactive Material

P.O. #	ORDERED BY	LAB NO.	NUC-LIDE	mCi	SURFACE mR/HOUR	1 METER mR/HOUR	LABEL TYPE	WIPE TESTS dpm/100cm^2	CHECKED BY	DATE	COMMENTS **
598158	HOGAN	68-638	P-32	1.47mCi	<.05	<.05	WHITE1	<MDA	MH	8/18/95	
596558	Plough	E17325	S-35	5.90mCi	<.05	<.05	N/A	<MDA	GS	8.18.95	
598471	HOFFMAN	68-265	P-32	.319	.5	<.05	N/A	<MDA	MH	8/21/95	
598486	SHELIKOFF	68-346	S-35	1.078mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
597797	CHEN	E25-342	C-14	20uCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
598478	JENNY LOWE	68-511	S-35	.570mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
567161	KELLER	68-559	S-35	5.391mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
567176	SMITH	E17-222	P-32	.319mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
598484	LUO	68-347	P-33	.329mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
598482	SWANSON	E25-545	P-32	1.27mCi	<.05	<.05	WHITE 1	<MDA	MH	8/21/95	
030F70005	TONEGAWA	E17-360	P-32	1.27mCi	.5	<.05	WHITE1	<MDA	MH	8/21/95	
577421	SHARP	E17-529	S-35	.894mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
598497	TONEGAWA	E17-396	P-32	1.27mCi	.2	<.05	WHITE 1	<MDA	MH	8/21/95	
598480	FARRUGGIO	68-683	S-35	2.3mCi	<.05	<.05	N/A	<MDA	MH	8/21/95	
030F70006	TONEGAWA	E17-360	P-32	1.27mCi	<.05	<.05	WHITE 1	<MDA	MH	8/21/95	
598159	ANN BLACK	38-377	S-35	13mCi	.2	<.05	WHITE 1	<MDA	MH	8/21/95	
598706	M DAVIS	E17430	P-32	.594mCi	1	<.05	N/A	<MDA	MH	8/22/95	
030F74180	HORVITZ	68-441	P-32	1.287mCi	1	<.05	YELLOW 2	<MDA	MH	8/22/95	

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(^{32}P) INVENTORY LOG SHEET (9/1 – present)

DATE REC'd	VENDOR	ITEM	PKG SIZE	LOT #	ACTIVITY
9/1/95	NEN	α^{32}P dATP	1mCi	012H08315	10mCi/ml (9/9)
9/6/95	NEN	α^{32}P dCTP	1mCi	013H08315	" (9/9)
9/7/95	NEN	γ^{32}P ATP	250μCi	002H09075	
9/11/95	NEN	α^{32}P dCTP	1mCi	013H09075	10mCi/ml (9/16)
9/14	"	"	"	013H09145	" (9/23)
9/14	"	α^{32}P dATP	"	012H09145	" "
9/25	"	" dCTP	"	013H09215	" (9/30)
2x 10/4	"	" "	"	013H09285	" (10/7)
2x 10/4	"	" "	"	"	" "
10/4	"	" dATP	"	012H09285	" "
10/10	"	" dCTP	"	013H10055	" (10/14)
2x 10/10	"	" "	"	"	" "
10/16	"	" dCTP	"	013H10125	" (10/21)
10/16	"	" dATP	"	012H10125	" "
10/23	"	" dCTP	"	013H10195	" (10/28)
10/23	"	γ^{32}P ATP	250	502Z10195	" (10/28)
10/26	"	α^{32}P dCTP	1mCi	013H10265	10mCi/ml (11/4)
11/1	"	"	1mCi	013H10265	"
11/6	"	"	1mCi	013H11025	" (11/11)
10/30	"	α^{32}P dATP	1mCi	012H10265	" (11/4)

(^3H) INVENTORY LOG SHEET (9/1 - present)

Rec'd	Vendor	ITEM	Pkg Size	Lot #	Activity
9/11	NEN	^3H-Thymidine (NET 027X)	5mCi	3106115	5mCi/5m.
10/31	NEN	"	"	3106122	"

^{35}S

INVENTORY LOG SHEET (9/1 - present)

DATE REC'D	VENDOR	ITEM	PKG SIZE	LOT #	Activity
9/13/95	Amersham	$\alpha^{35}S$ dATP(SJ1304)	1 mCi	AC9536	(10/2)
10/26/95	"	"	"	AC9542	(11/13)

^{51}Cr INVENTORY LOG-SHEET (9/1 - present)

Date Rec'd	Vendor	ITEM	Pkg Size	Lot #	Activity
10/26/95	NEN	^{51}Cr	1 mCi	95M562	5 mCi/ml

Radioisotope Log '95-96

Ordered (Lab)			P.O.	Rec'd
1/12/95	Phil	NEZ-033L ^{125}I 5mC	GFR5539Z2	✓
	David	NEZ-033A ^{125}I 2mCi	GFR539622	✓
1/30	Brian	BNeG-002Z $\gamma^{32}P$-ATP 250mCi	HH	—
1/30	Min	PB20383 ^{32}P-UTP 250μc	HH	—
2/6	Lab	^{35}S-dATP Amersh.	HH	—
2/13	Lab	^{3}H Thymidine 5mCi	HH	✓
2/16	min	^{32}P-UTP PB20383 250mCi		✓
2/21	Lab	$\alpha^{35}S$-dATP AG1002 1mCi	HH	✓
2/22	David	^{125}IR NEZ033A 5mCi	GFR5530084	✓
2/22	Suzana	^{3}H Thymidine NET027X 1X 5mC	HH	✓
3/8	Linda	^{32}P-orthophosphate-640405 ILN 10mCi	HH	✓
3/15	Juan	^{51}Cr NEZ-0305 10mCi	9219	—
3/27	David	^{125}I-NEZ-033A 5mCi	GFR559158	—
4/14	Zhou	$\gamma^{32}P$-ATP 002Z 250μc	HH 030F72820	✓
4/19	Juan	^{51}Cr NEZ-0305 1mCi	HH 030F72855	✓
5/4	Zhou	$\gamma^{32}P$ ATP NEG#002Z 250μCi	HH	—
5/9	Lab	^{32}P dCTP extra 1mCi	HH	✓
5/16	Phil	^{125}I NEZ-033L 5mCi	HH	—
6/2	Zhou	$\gamma^{32}P$ ATP NEG 002Z 250μCi		—
6/3	Hayden	$\gamma^{32}P$ ATP NEG 002A 250mCi	GFR-576925	✓
6/9	Min	^{32}P UTP PB10203	GFR578552	✓
	Chong	^{3}H-MK801 NEN 1mCi		✓
6/20	Lab	^{35}S-dATP	GPR-583447	✓
6/27	HH	$\gamma^{32}P$-dATP 002Z	Shu	✓
7/02	Juan	NEZ 0305 ^{51}Cr 10mCi	Shu	✓

Radioisotope Log 95-96

Ordered (lab)				P.O.	Rec'd
7/26	mcg	dCTP ^{32}P	1mc x3	GPR-593003	✓
8/5	MMC	^{125}I Epidepride	10 μCi Amersh.		✓
8/9	"	^{125}I Iodosulpride	25 μCi.		✓
8/16	Lab	^{32}PdCTP	1 mL	GER 598493	✓

Radioisotope Log '94-95

Ordered (Lab)				Rec'd
7/6/94	Zhou	Neg-0028	γ^{32}P-ATP 1mCi	✓
7/25/94	Heather	Neg 034H	α^{35}S-dATP 1mCi	–
8/2/94	Linda	Neg 002A	γ^{32}P-ATP 1mCi	–
8/4/94	Lab	SJ1304	^{35}S-dATP 1mCi	–
8/5/94	Lab	NET027X	^{3}H-Thymidine 5mCi	–
8/10/94	Heather	NEG-034H	^{35}S-dATP 1mCi	–
8/30/94	Lab	SJ1304	^{35}S-dATP 1mCi	–
9/6/94	Zhou/Heather	NEG-034H	^{35}S-dATP 1mCi	–
9/13/94	Hayden	NEG-002A	γ^{32}P-ATP 250μCi	✓
9/22/94	Zhou	^{35}S-UTP	NEG-039H 250μCi	–
9/26/94	Toshi	BLG-013H	^{32}P-dCTP 1mCi	✓
9/30/94	Lab	NET027X	^{3}H-Thymidine 5mCi	✓
10/6/94	Zhou	NEG-034H	^{35}S-dATP 1mCi	✓
10/8/94	Lab	SJ1304	^{35}S-dATP 1mCi	✓
10/10/94	Ming	NEG 039H	^{35}S-UTP 250μCi	–
10/10/94	Ming	NEG-027	γ^{35}S-ATP 250μCi	–
10/18/94	Min	NEG-002A	γ^{32}P-ATP 500μCi	✓
10/20/94	Min	NEG-002A	γ^{32}P-ATP 1mCi	✓
10/31/94	Zhou	NEG-039C	^{35}S-UTP 1mCi	✓
12/6/94	Linda	NEG 009H	^{35}S-methionine 1mCi	✓
12/23/94	Antonio	NET027X	^{3}H-Thymidine 5mCi	✓
12/24/94	Sugawa	NET027X	^{3}H-Thymidine 5mCi x2	✓

Isotope Request Log

DATE	NAME	ITEM REQUESTED	QUANTITY μl	QUANTITY μCi	PURPOSE	DATE USED	DATE DISP
10/30/95	LAYON	^{32}P-dCTP (11/4)	40		Probe	10/30	11/2
10/31/95	JIE	^{35}S-dATP (10/2)	10		SEQU	10/31	11/2
11/2/95	JIE	^{32}P-dCTP (11/4)	20		Probe	10/31	11/1
11/1/95	ZHOU	^{32}P-dCTP (11/4)	7		Probe	11/1	11/2
11/2/95	Joe	^{3}H-Thymidine (10/31)	83ul			11/2/95	11/9/95
11/2/95	JIE	^{32}P-dCTP (11/4)	20		Probe	11/3/95	11/4/95
"	KAZU	"	10		"	"	"
10/27/95	David	^{3}H-Thymidine ( )	250			10/28/95 →	
11/6/95	Jie	^{32}P-dCTP (11/4)	10		Probe	11/6/95	11/7/95
11/7/95	LINDA	^{32}P-dCTP (11/4)	20		Probe	11/7/95	11/8/95
11/8/95	LAYON	γ^{32}P-ATP (10/26)	15		Probe	11/8/95	11/15/95
11/8/95	ZHO	^{32}P-dCTP (11/4)	10		Probe	11/8/95	11/9/95

Isotope Request Log

DATE	NAME	ITEM REQUESTED	QUANTITY — µl	µCi	PURPOSE	DATE USED	DATE DISP
10/20	HAYON	^{32}P-dATP (10/24)	40	✓	Probe	10/20	10/23
"	LINDA	^{32}P-dCTP (10/14)	10		"	"	"
"	JIE	"	10		"	"	"
"	MING	"	5		"	"	"
10/21	kazu	^{32}P-dATP (10/16)	18	✓	"	10/21-10/22	10/24
10/21	LINDA	^{32}P-dATP (10/21)	10	✓	"	10/21	10/22
10/23	HAYON	^{32}P-dATP (10/21)	20	✓	"	10/23	10/24
10/24	kazu	^{32}P-dCTP (10/28)	10		"	10/24	10/25
10/24	Zhou	^{32}P-dCTP (10/28)	7	✓	"	10/24	10/26
10/24	YANYAN	^{32}P-dCTP (10/28)	10	✓	"	10/24	10/26
10/24	HAYON	^{32}P-dCTP 10/28	60	✓	"	10/24	10/30
"	JIE	"	20	✓	"	"	10/25
10/25	DINA	^{35}S-dATP (10/2)	10		SEQU	10/25	10/26
10/26	Josh	^{32}P-dCTP (11/4)	10	✓	Probe	10/26	10/28
10/26	TAK	^{32}P-dCTP (11/4)	10	✓	"	"	"
10/27	Toshi	^{32}P-dCTP (11/4)	10	✓	Probe	10/27	10/28
10/26	Linda	^{32}P dCTP (11/4)	20	✓	Probe	10/26	10/28
10/27	KAZU	γ^{32}P dATP (10/28)	1.2µl			10/27	10/30
10/27	Rebecca	^{3}H-Thymidine	800			10/27	10/30
10/28	MAX	^{32}P dCTP 11/4	20	✓	Probe	10/28	10/30
"	"	^{32}P-dATP 10/21	20	✓	"	"	"
"	KAZU	^{32}P-γdATP 10/23	1µl		"	"	"
~~"~~	~~"~~	~~^{32}P γdATP 10/28~~	~~1µl~~		~~"~~	~~"~~	~~"~~
10/30	Patrick	^{32}P-dCTP (11/4)	5µl	✓	Probe	10/30	11/1

Isotope Request Log

DATE	NAME	ITEM REQUESTED	QUANTITY ml	QUANTITY uCi	PURPOSE	DATE USED	DATE DISP
10/5	KAZU	^{32}P-dCTP (10/9)	1×10		Probe	10/5	10/6
10/6	Toshi	^{32}P-dCTP (10/9)	2×10		Probe	10/6	10/7
"	Kazu	^{32}P-dCTP (10/9)	1×10		Probe	10/6	10/7
10/6	HAYDN	^{35}S-dATP (10/7)	1×10		SEQU	10/6	10/7
10/6	JIE	"	2×10		"	10/7	10/11
"	Kazu	^{32}P-dCTP (10/9)	1×10		Probe	10/6	10/7
10/8	HAYDN	^{32}P-dCTP (10/7)	10×10		Probe	10/8	10/10
10/8	JIE	^{32}P-dATP (10/7)	2×10		Probe	10/8	10/4
10/8	YANYAN	"	2×10		Probe	10/7	10/4
10/10	Rebeca	^{32}P-dATP (10/7)	1×10		Probe	10/10	10/11
10/10	Josh	^{32}P-dATP (10/7)	2×10		Probe	10/10	10/11
10/11	HAYDN	^{32}P-dCTP (10/14)	75λ		Probe	10/11	10/13
10/12	KEN	"	1×10		"	10/12	10/13
"	ZHOU	"	1×10		"	10/12	10/13
10/13	Kazu	^{32}P-dCTP (10/14)	1×10		"	10/13	10/14
10/14	Mar	[illegible]	1×10		"	10/14	10/15
10/14	LINDA	^{32}P-dCTP (10/14)	1×10		Probe	10/14	10/15
10/14	PATRIK	^{32}P-dCTP (10/14)	1×10		"	"	10/15
10/16	Rebeca	^{32}P dCTP (10/21)	1×10	-	"	10/16	10/17
10/16	Dong	^{32}P dCTP (10/21)	1×10	-	"	"	"
10/16	Yan	^{32}P dCTP (10/21)	2×10	-	"	"	"
10/16	Linda	^{32}P dCTP (10/21)	1×10	-	"	10/16	10/17
10/16	HAYDN	^{32}P dCTP (10/14)	3×10		Probe	10/17	10/18
10/18	Linda	^{32}P dCTP (10/21)	1×10	-	"	10/18	10/19

Isotope Request Log

DATE	NAME	ITEM REQUESTED	QUANTITY μl	QUANTITY μCi	PURPOSE	DATE USED	DATE DISP
9/19	Rebecca	^{32}P dCTP (9/23)	1x10		Probe	9/19	9/21
9/20	HAYON	^{35}S dATP (10/2)	6.5		SEQU	9/20	9/21
9/20	LINDA	^{32}P dCTP 9/23	1x10		Probe	9/20	9/21
9/21	HAYON	^{32}P dCTP (9/23)	1x10		Probe	9/21	9/21
9/21	MING	^{32}P dCTP (9/23)	5		Probe	9/21	9/22
9/21	JIE	^{32}P dCTP (9/23)	10		Probe	9/21	9/22
9/21	JIE	^{35}S - dATP (10/2)	10		SEQU	9/21	9/22
9/21	LINDA	^{32}P - dCTP (9/23	10		Probe	9/23	9/24
9/25	Dina	^{32}P - dCTP (9/23)	2x10		Probe	9/25	9/27 E
9/25	TAIL	^{32}P - dCTP (9/30)	5		"	"	"
9/25	LINDA	^{32}P - dCTP (9/23)	10		Probe	9/25	9/26
9/25	HAYON	^{35}S - dATP (10/2)	10		SEQU	9/25	9/27
9/27	Rebecca	^{32}P - dCTP (9/30)	10		Probe	9/27	9/29
9/28	Jie	^{32}P - dCTP (9/30)	2x10		probe	9/28	9/29
9/29	Dina	^{32}P - dCTP (9/30)	2x10		probe	9/29	9/30
9/30	HAYON	^{32}P - dCTP (9/23)	2x10		PROBE	9/30	10/1
9/30	HAYON	^{32}P - dCTP (9/30)	3x10		PROBE	9/29	10/1
10/1	LINDA	^{32}P - dCTP (9/30)	2x10		PROBE	10/1	10/2
10/2	Toshi	^{32}P - dCTP (10/9)	1x10		Probe	10/2	10/2
10/2	Dong	^{32}P - dCTP (10/9)	1x10		Probe	10/2	10/2
10/3	JIE	^{32}P - dCTP (10/9)	2x10		Probe	10/3	10/4
10/4	KEN	^{32}P - dCTP (10/9)	2x10		Probe	10/4	10/5
10/4	Dina	^{32}P - dCTP (10/9)	1x10		Probe	10/4	10/5
10/5	Rebecca	^{32}P - dATP (10/9)	1x10		Probe	10/5	10/6

ISOTOPE REQUEST LOG

DATE	NAME	ITEM REQUESTED	— QUANTITY — μl	μCi	PURPOSE	approx DATE USED	approx DATE DISP
9/1	Jie	^{32}P dATP (9/9)	2X10		Probe	9/2	9/2
"	"	^{35}S dATP (7/10)	10		Seq.	9/4	9/4
"	MING	^{32}P dATP (9/9)	2X10		Probe	9/2	9/4
9/5	Ken	^{32}P dATP (9/9)	2X10		Probe	9/5	9/6
9/6	Rebecca	"	2X10		Probes	9/6	9/7
9/6	Dina	"	2X10		Probes	9/6	9/7
9/6	Jie	^{32}P dCTP 9/9	2X10		Probe	9/6	9/7
9/6	Zhen	"	10		Probe	9/6	9/7
9/6	MAZ	"	3X10		probe	9/6	9/7
"	"	" 8/26	2X10		probe	9/6	9/7
"	Hayden	^{32}P dCTP 9/9	2X10		probe	9/7	9/7
9/7	Jie	^{32}P dCTP 9/9	2X10		probe	9/8	9/9
9/8	Hayden	^{35}S dATP	1X10		Seq	9/8	9/10
9/11	Rebecca	^{32}P -dCTP (9/16)	2X10		probe	9/11	9/13
9/11	Dina	"	1X10		"	"	"
9/11	TAKU	"	1X10		"	"	"
9/12	Jie	^{32}P-dCTP (9/16)	2X10		probe	9/12	9/14
9/12	Linda	^{32}P -dCTP (9/16)	2X10		probe	9/12	9/14
9/12	David	^{3}H Thymidine		1mCi	pulse cells	9/12 →	
9/13	Dina	^{32}P -dCTP (9/16)	2X10		probe	9/13	9/15
9/14	Toshi	^{32}P -dCTP (9/23)	1X10		Probe	9/14	9/16
9/14	Hayden	^{32}P -dCTP (9/23)	3X10		Probe	9/14	9/16
9/16	JIE	^{32}P-dCTP (9/23)	8		Probe	9/16	9/18
9/16	"	^{35}S-dATP (7/10)	2X10		SEQUENCE	9/16	9/18

^{32}P usage Summary

Rec'd	Date @ 10mCi/ml	ITEM	vol(μl) need	vol(μl) unused
9/1	9/9	$\alpha^{32}P$ dATP (012H08315)	100	0
9/6	9/9	$\alpha^{32}P$ dCTP (013H08315)	100	0
9/7	9/16	$\gamma^{32}P$ dATP (002A09075)	0	~~0~~ 25
9/11	9/16	$\alpha^{32}P$ dCTP (013H09075)	100	0
9/14	9/23	" " (013H09145)	90	10
9/14	9/23	" dATP (012H09145)	0	100
9/25	9/30	" dCTP (013H09215)	105	0
2× 10/4	10/7	" " (013H09285)	100	0
10/4	10/7	" " "	100	0
10/4	10/7	" dATP (012H09285)	70	40
2× 10/10	10/14	" dCTP (013H10055)	110	0
10/10	10/14	" " "	110	0
10/16	10/21	" " (013H10125)	~~100~~ 60	40
10/16	10/21	" dATP (012H10125)	~~100~~ 108	~~0~~ 0
10/23	10/28	" dCTP (013H10195)	97	0
10/23	10/28	$\gamma^{32}P$ dATP (502Z10195)		
10/26	11/4	$\alpha^{32}P$ dCTP (013H10265)	100	0
10/30	11/9	" dATP (012H10265)	0	100
11/1	11/9	" dCTP (013H10265)	102	0
11/6	11/11	" dCTP (013H11025)		

^{35}S usage Summary

Recd	Date @ 10mCi/ml	ITEM	Vol(ml) used	Vol(ml) used
9/13/95	10/2	α-^{35}S dATP (4C9536)	[redacted]60	[redacted]40

^3H Usage Summary

Rec'd	ITEM	Exptd.	Vol (ml) used	Vol (ml) remaining
9/11	^3H-Thymidine (3106115)	1mCi/ml	4	1

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ENVIRONMENTAL MEDICAL SERVICE

77 MASSACHUSETTS AVENUE,ROOM 208-238
CAMBRIDGE, MASSACHUSETTS 02139-4307
U.S.A.

TELEPHONE: (617) 253-5360
FAX: (617) 253-4879

FACSIMILE COVER SHEET

THERE ARE 16 PAGES INCLUDING THIS ONE.

TO: Cherie Siegel

FROM: Mitch Galin K

SUBJECT: D. King Inventory Log

DATE:

COMMENTS/REMARKS:

BEST REGARDS,

10-95-210

American Association of Poison Control Centers

Intentional Radioisotope Exposures

1983-1994

Year	*Total Number of Cases in Database*	*Intentional Radioisotope Exposures*
1994	192	1
1993	166	0
1992	125	4
1991	124	3
1990	152	0
1989	171	5
1988	110	2
1987	115	2
1986	126	0
1985	39	0
1984	19	1
1983	18	1
TOTALS:	**1357**	**19**

10-95-211

October 27, 1995

CAL No. 1-95-015

Dr. David J. Litster
Vice President and Dean for Research
Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, MA 02139

SUBJECT: CONFIRMATORY ACTION LETTER - SUPPLEMENT 1

Dear Dr. Litster:

Thank you for your letter dated October 24, 1995 in response to my letter dated October 17, 1995.

Based on the information contained in your letter and on discussions between Frank Massé, Radiation Protection Officer (RPO) for MIT, Mitch Galanek, Associate Radiation Protection Officer (ARPO) for MIT and John Kinneman, Chief, Nuclear Materials Safety Branch of my staff at your facility on October 25, 1995 and by telephone between Mr. Massé and Mr. Kinneman on October 26, 1995, and between D. Haes of your staff and Mr. Kinneman on October 27, 1995, we understand that you have taken or will take the following actions:

ACTIONS COMPLETED

1. An assessment of security of facilities where licensed materials are used at MIT has been completed and you have identified and prioritized items needing action. These actions are described below.

2. The MIT RPO and staff met with the Director of the Cancer Research Center (CRC) to discuss the importance of security of licensed material. Following that meeting, CRC managers met with staff throughout the CRC to emphasize the importance of following existing security procedures and securing all licensed material.

3. The Radiation Protection Staff has notified all authorized users of licensed material either electronically or in person that, in addition to existing security procedures, a locked container will be required for the storage of licensed materials which are required to be labelled in accordance with NRC regulations.

4. The Associate Radiation Protection Officer has personally visited each laboratory where licensed material is used in the CRC to evaluate the suitability of locations identified by authorized users for the storage of stock materials.

060030

OFFICIAL RECORD COPY

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5. The laboratory in CRC, where the individual who received the exposure to phosphorus-32 during August worked, now has locked containers where licensed materials which are required to be labelled in accordance with NRC regulations are stored. Only specially designated individuals have keys to the storage containers in that laboratory.

ACTIONS TO BE COMPLETED

1. Each laboratory where licensed materials are used will have a locked container for storage of licensed materials which are required to be labelled in accordance with NRC regulations. Keys or combinations will be restricted to individuals authorized to use licensed materials. When they receive the key or combination, these individuals will receive instruction in your procedure that all such materials must either be immediately attended by an individual authorized to use licensed material or locked in the container. This will be accomplished on the following schedule:

   By October 27, 1995, each laboratory in the CRC will have this arrangement in place.

   By November 27, 1995, each laboratory on the MIT campus authorized to use licensed material will have this arrangement in place.

2. By November 27, 1995, you will determine the most appropriate method to re-communicate the MIT procedures for securing licensed material and locations where licensed materials are used to all individuals who work with licensed material, implement the communication and provide a written confirmation that the process is complete to this office.

3. By November 13, 1995, you will assure that your routine weekly and monthly survey visits to laboratories where licensed materials are used includes an evaluation of the security of licensed materials and facilities. This will include a review of the procedures with those individuals responsible for making those visits.

4. By November 27, 1995, you will strengthen your procedure for the delivery of licensed materials to laboratories by assuring that all individuals who receive licensed materials in laboratories understand that those materials must be immediately logged in and secured.

5. By November 13, 1995, you will audit a representative sample of all laboratories where licensed materials are used to determine the status of security of licensed materials. The audit will include assessment during night and weekend hours and will include at least 10 per cent of the laboratories where licensed materials are used. You plan to use the results of this audit to assess whether the actions you are taking to

improve security are appropriate and have been effective and to provide information for your presentation to the Radiation Protection Committee. You will conduct another audit approximately December 15, 1995. You will record and provide the results of both audits to this office by December 31, 1995.

6. By November 27, 1995, in consultation with your Radiation Protection Committee, you will develop a plan for improving your procedures for the control of access to areas where licensed materials are used. By December 15, 1995, you will describe that plan to this office in writing and provide a schedule for implementation.

Additionally, we understand that you will continue to enforce adherence to your existing security program which requires that laboratories containing any licensed materia (including waste), not otherwise locked up, be secured when not occupied by an individual authorized to use licensed material.

Pursuant to Section 182 of the Atomic Energy Act, 42 U.S.C. 2232, you are required to:

1) notify me immediately if your understanding differs from that set forth above;

2) notify me if for any reason you cannot complete the actions within the specified schedule and advise me in writing of your modified schedule in advance of the change; and

3) notify me in writing when you have completed the actions addressed in this Confirmatory Action Letter.

Issuance of this Confirmatory Action Letter does not preclude issuance of an order formalizing the above commitments or requiring other actions on the part of the licensee; nor does it preclude the NRC from taking enforcement action for violations of NRC requirements that may have prompted the issuance of this letter. In addition, failure to take the actions addressed in this Confirmatory Action Letter may result in enforcement action.

The responses directed by this letter are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Pub. L. No. 96-511.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, and your response, will be placed in the NRC Public Document Room (PDR). To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be placed in

the PDR without redaction. However, if you find it necessary to include such information, you should clearly indicate the specific information that you desire not to be placed in the PDR, and provide the legal basis to support your request for withholding the information from the public.

Sincerely,

Original Signed By

Thomas T. Martin
Regional Administrator

License No. 20-01537-02

cc:
Commonwealth of Massachusetts
F. X. Massé
R. McCunney

Distribution:
PUBLIC
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DOCUMENT NAME: S:\PENDING\MIT-CAL.JDK

OFFICE	DNMS/RI	DNMS/RI	DNMS/RI	
NAME	CHehl	KSmith	TMartin	
DATE	10/27/95	10/26/95	10/27/95	

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10-95-216

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415
FAX NO. (610) 337-5393

FACSIMILE TRANSMITTAL

DATE: 11/24/95

MESSAGE TO: JOHN GLENN
IIT

TELECOPY NUMBER: 301-415-6382

NUMBER OF PAGES: 14
(Including this cover sheet)

MESSAGE FROM: Betsy Ullrich 610-337-5040
U.S.N.R.C. Region I, King of Prussia, PA

TRANSMITTED BY: BU

DATE & TIME: 11/24/95 815A

VERIFIED BY:

John - This is an incident brought to my attention by a R1 inspector, who was employed by the city of DC at the time this happened.

BU

Veterans Administration

APR 1 2 1985

In Reply Refer To 115

Office of Inspection and Enforcement
Attn: James M. Taylor, Director
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

1. This is in response to a letter received at this facility on March 12, 1985, under Docket No. 30-17020, License No. 31-00636-07, pertaining to events surrounding an incident involving excessive exposure of a research worker to iodine - 125.

2. It is acknowledged that on August 3, 1984 during a routine bioassay a foreign senior scientist who came to the Medical Center for specialty training under the auspices of WHO was found to have 524 microcuries iodine-125 in his thyroid gland. It is to be noted that the researcher was not a VA employee and therefore was not subject to disciplinary actions that could be taken under Civil Service regulations for infraction of rules.

3. There was no evidence for air-borne iodine-125 in excess of the maximum permissible since had that occurred there would have been a deposit of such material on various surfaces which would have been revealed during numerous wipe-tests that were subsequently performed.

4. Although the only credible method for intake of the iodine-125 was ingestion, presumably because of mouth pipetting, the individual denied such action but claimed that he failed to wear gloves on both hands as required by laboratory regulations, and that the transfer might have occurred by his failure to wear a glove on one hand, inadvertently spilling of radioactivity on that hand, with subsequent transfer of the radioactivity from that hand to mouth. Had several millicuries of of iodine-125 been spilled in this fashion on an ungloved hand that hand would have been highly contaminated and it would have been expected that significant contamination would have been transferred to door handles and other laboratory surfaces. Wipe tests failed to reveal such contamination. Therefore the individual's story of an ungloved hand is not credible. Thus there is no supporting evidence that would be consistent with the failure of the investigator to wear a disposable glove on his right hand while working with seven millicuries of iodine-125.

8504260212

5. In view of the above it is denied that there was an individual in a restricted area who was exposed to radioactive material such that uptake from either inhalation or absorption in excess of permissible levels could have occurred. Furthermore the absence of evidence for transfer of contamination from an ungloved hand suggests that the story was a fabrication and that there is no objective support for the allegation that the individual failed to use disposable gloves while working with millicurie amounts of iodine-125.

6. It should be noted that the amount of radioiodine ingested was considerably less than generally would be employed for the treatment of hyperthyroidism and is even less than that often used in tracer tests for the diagnosis of thyroid cancer. A patient receiving such a dose would be free to move around the Medical Center or to leave the Medical Center without observing any special precautions since it is considered that he would not present a danger to the community. Nontheless special precautions were taken with regard to other persons associated with the researcher.

a. Thyroid counts were immediately made on all laboratory personnel.
b. Regular weekly thyroid measurements over a 5 month period were made on three colleagues who shared an apartment with him on the facility. No thyroidal overexposure was noted.
c. Quarters in a single room were provided for him for a three week period in the laboratory complex in which he worked and decontamination of the minute levels of radioactivity in the shared apartment was effected.

7. Considerable efforts were made to minimize medical effects in the concerned individual. Since the actions of the individual were bizarre and unpredictable, the individual was referred for psychiatric evaluation and supportive therapy. In spite of this a complete description of the event was not obtained. Nontheless the individual did not indulge in further self-destructive acts. To minimize radiation alteration of the thyroid, the individual was placed on blocking doses of Tapezole for a period of almost two months. That this resulted in a significant reduction of thyroid dose, probably by a factor of two, is evidenced by an effective T1/2 for thyroidal radioiodine of 21 days while on the drug compared to an effective T1/2 of 43 days following discontinuation of drug therapy. Thus the thyroidal absorbed dose is considerably less than 2000 rads calculated at the time of the incident.

8. It should be noted that the laboratory in which the incident occurred has been in operation since 1947 under the direct supervision of a radiation physicist certified in 1949 in Medical Nuclear Physics by the American College of Radiology and that since that time there has never been another inci-

dent involving ingestion of radioactivity above permitted levels. During this period independent investigators, but not technicians, have had open access to the laboratory 24 hours a day, 7 days a week. The freedom to operate in this fashion undoubtedly accounts for the acknowledged productivity of the laboratory. Nontheless in view of this unfortunate incident it was decided to restrict access to the hot laboratory to the normal working day.

9. The remedial actions that have been taken include limiting access to the iodination laboratory to all investigators, including even senior personnel who for decades have not had such restrictions, to the normal working day and to reinforcing the regulations that have been in force for use of this laboratory. This laboratory is already under supervision of two independent qualified radiation safety specialists. It is not evident what the role would be for a third set of radiation safety specialists in auditing the program. Since the NRC inspection revealed no specific programmatic weakness there is no reason to anticipate that another outside body would prove to be more competent than the NRC inspectors. Thus it is unlikely that such audits would reveal any departures from procedural requirements. In addition occasional unannounced audits could not prevent an incident such as the one that occurred.

10. It is requested that the Regional Administrator, NRC Region 1, terminate the recommended conditions since they would not prevent or mitigate the consequences of such an incident nor has the NRC found evidence that routine operation of the licensee, which is what would be observed in an unannounced audit, departs in any way from commonly accepted procedures.

Sincerely yours,

K. L. Mulholland, Jr.
Medical Center Director

Enclosure:
Addendum

cc: Regional Administrator Region I
631 Park Ave.
King of Prussia, Penn., 19406

Docket #30-17020
License No. 31-00636-07
EA 84-98

ADDENDUM:

Proposed corrective measures that have been put into effect include:

1. All iodination procedures and use of iodine stock solution will be restricted to normal duty hour and normal work days.

2. A policy has been established and promulgated which requires that any deviation from established safety procedures by any investigator during use of the iodination laboratory will result in permanent exclusion of the investigator from that facility.

3. All staff who have less than 3 years experience with iodination procedures will have thyroid uptake measurements within one week of each iodination. All senior staff will continue to be monitored as per NRC Guide 8.20. Bioassays will continue to be performed ad hoc as the occasion arises if there is a known spill, dropped vial, broken pipette, etc.

4. Any senior staff member whose measured iodine level exceeds 50 percent of the limit set by Guide 8.20 will be returned to the monitoring schedule which requires bioassay within one week of an iodination procedure. This will continue until a return to a stable thyroid burden of less than 0.060 µCi is observed over a calendar quarter. Quarterly measurement may be resumed when this condition is met if the causes of the original elevation are identified and eliminated.

5. A scintillation type detector system (Ludlum Model 18 Analyser with Model 44-17 scintillation probe) was purchased by the Administration to increase the sensitivity of radiation surveys for ^{125}I.

6. Radiation surveys of the entire work area of the affected laboratory complex will be performed weekly or more frequently if there were evidence for any potentially hazardous event.

7. During periodic retraining sessions for all staff who use by-product material:

    a. Special emphasis will be placed upon the hazards associated with deviations from established procedures for safe handling of by-product materials.
    b. Special emphasis will be placed upon the use of protective clothing and gloves.

c. Special emphasis will be placed upon the requirement to promptly report contamination associated with accidents in the handling of by-product materials.

VAMC
Bronx, N.Y. 10468

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

MAR 05 1985

Docket No. 30-17020
License No. 31-00636-07
EA 84-98

Veterans Administration Medical Center
ATTN: Mr. K.L. Mulholland, Jr.
Director
130 West Kingsbridge Road
Bronx, New York 10468

Gentlemen:

SUBJECT: ORDER MODIFYING LICENSE AND NOTICE OF VIOLATION
(NRC INSPECTION 84-01)

This refers to the NRC safety inspection conducted on August 9-10, 1984 of activities authorized by NRC License No. 31-00636-07. The report of the inspection was forwarded to you on August 29, 1984. The inspection was conducted to review the circumstances associated with a radiation exposure to a licensee researcher to Iodine-125 in excess of the NRC regulatory limit. The exposure was reported to NRC Region I by your Radiation Safety Officer on August 8, 1984. During the inspection, another violation of NRC requirements was identified. On September 5, 1984, we held an enforcement conference with you and members of your staff during which these violations, their causes, and your corrective actions were discussed.

The violations are described in the enclosed Notice of Violation. The first violation described in the Notice is of significant concern to the NRC because it involves an exposure to radioactive material equivalent to an exposure 554 times the regulatory limit. Although the cause of the exposure was not identified, the second violation, involving the failure of an individual to wear a glove while handling Iodine-125, may have contributed to the exposure. These violations demonstrate the importance of a strong and effective radiation safety program, adherence to NRC requirements, and safe performance of licensed activities. You are reminded that it is the responsibility of the licensee to assure that all radiation workers are knowledgeable of NRC requirements and safe practices for handling of licensed material, to actively monitor all uses of radioactive material to provide early detection of problems, and to promptly and effectively implement corrective actions to prevent recurrence of violations.

To emphasize the importance of adherence to NRC requirements and safe performance of licensed activities, I have decided to issue the enclosed Order Modifying License requiring periodic unannounced audits of the radiation safety program by an independent third party. The Order requires a third party to observe the action of your employees involved with the use of licensed material to verify adherence to NRC requirements.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

MAR 0 5 1985

Veterans Administration
Medical Center

The violations associated with this occurrence have been classified in the aggregate at Severity Level I in accordance with the General Statement of Policy and Procedure for NRC Enforcement Actions, 10 CFR Part 2, Appendix C, as revised, 49 FR 8583 (March 8, 1984). Although civil penalties are normally proposed for Severity Level I violations, I have determined that issuance of the enclosed Order is the more appropriate action in this case.

You are required to respond to the enclosed Order and Notice and, in preparing your response, you should follow the instructions specified in the Notice. Your reply to this letter, Order, and Notice, and the results of future inspections, will be considered in determining whether further enforcement action is appropriate.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosure will be placed in the NRC's Public Document Room.

The responses directed by this letter, and the enclosed Order and Notice, are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Sincerely,

James M. Taylor, Director
Office of Inspection and Enforcement

Enclosures:
1. Order Modifying License
2. Notice of Violation

cc:
Public Document Room (PDR)
Nuclear Safety Information Center (NSIC)
State of New York

NOTICE OF VIOLATION

Veterans Administration Medical Center
Bronx, New York 10468

Docket No. 30-17020
License No. 31-00636-07
EA 84-98

An NRC inspection of activities authorized under NRC License No. 31-00636-07 was conducted on August 9-10, 1984, to review the circumstances associated with a violation of NRC requirements involving an exposure of a licensee employee to iodine-125. The NRC has concluded that although the exact route of uptake of iodine-125 was not determined, the resultant uptake of iodine-125 was equivalent to that which would have resulted from an occupational exposure to an airborne concentration of 554 times the regulatory limit. During the inspection, one other violation of NRC requirements was identified.

The two violations have been categorized in the aggregate at Severity Level I. In accordance with the General Statement of Policy and Procedure for NRC Enforcement Actions, 10 CFR Part 2, Appendix C, the violations are listed below:

A. 10 CFR 20.103(a)(1) states that no licensee shall possess, use, or transfer licensed material in such a manner as to permit an individual in a restricted area to be exposed to radioactive material such that the uptake by any organ from either inhalation or absorption or both routes of intake in any calendar quarter exceeds that which would result from inhaling such radioactive material for 40 hours per week for 13 weeks, that is, 520 hours, at the maximum permissible concentrations (MPC) specified in 10 CFR Part 20, Appendix B, Table I, Column 1.

Contrary to the above, on or before August 3, 1984, a researcher at the licensee's facility received a thyroid burden equivalent to an exposure of 288,000 MPC hours to airborne iodine-125 during the third calendar quarter of 1984, an amount 554 times the limit specified in 10 CFR Part 20, Appendix B, Table I, Column 1.

B. Condition 23 of License No. 31-00636-07 requires that licensed material be possessed and used in accordance with statements, representations and procedures contained in an application received July 3, 1978.

Item 15 of the application requires that individuals working with licensed material wear disposable gloves.

Contrary to the above, on July 28, 1984, one individual working in the research laboratory did not wear a disposable glove on his right hand while working with seven millicuries of iodine-125.

Collectively, these violations have been categorized in the aggregate at Severity Level I (Supplements IV and VI).

UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the Matter of

VETERANS ADMINISTRATION MEDICAL CENTER
Bronx, New York 10468

Docket No. 30-17020
License No. 31-00636-07
EA 84-98

ORDER MODIFYING LICENSE

I

Veterans Administration Medical Center, Bronx, New York, (the "licensee"), is the holder of specific byproduct Material License No. 31-00636-07 issued by the Nuclear Regulatory Commission (the "NRC") pursuant to 10 CFR Part 30.

II

On August 9-10, 1984, an NRC safety inspection of the licensee's program was conducted to review the circumstances associated with a radiation exposure of a licensee employee to iodine-125 in excess of the regulatory limit. The exposure was reported to NRC Region I by the licensee's Radiation Safety Officer on August 8, 1984.

The exposure involved a researcher at the Medical Center having a thyroid burden of 524 microcuries of iodine-125, which was identified by the Medical Center during a routine thyroid bioassay on August 3, 1984. The exposure that the

individual received was the equivalent of 554 times the maximum permissible airborne concentration for a calendar quarter, resulting in an exposure to the individual's thyroid of approximately 2000 rads. The most likely cause of the uptake is through oral ingestion of the material.

Neither the licensee nor the NRC inspectors were able to conclusively determine how the researcher received the thyroid uptake. The researcher indicated that he had not been administered any iodine-125 for purposes of medical diagnosis or therapy. Although the individual routinely worked with millicurie quantities of iodine-125, the individual denied having mouth pipetted or using poor handling techniques, other than failing to wear a glove on his right hand while handling a stock vial containing seven millicuries of iodine-125 on July 28, 1984.

The seven millicuries of iodine-125, contained in 0.1 milliliters of solution, are no longer in the vial and cannot be accounted for by other uses. Although contamination as high as 3,000,000 disintegrations per minute per 100 square centimeters were found in a few areas of the individual's residence, the amount of iodine-125 in the individual's thyroid (524 microcuries) and the limited and relatively low amounts of surface contamination found in most areas of the laboratory and in his personal residence indicate that skin absorption is not likely to be the route of uptake. Much higher levels of external radioactive contamination on his person and on objects handled by him would be expected if this were the mode of entry. However, the only other credible mode of entry is by swallowing and, as noted above, the individual denied mouth pipetting.

Although no specific programmatic weaknesses in the licensee's program were identified during the inspection, the magnitude and seriousness of this exposure warrant additional actions to verify adherence by users of license material to NRC procedural requirements.

III

In view of the foregoing, and pursuant to Sections 81, 161(b), 161(o), and 182 of the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 CFR Part 2 and 10 CFR Part 30, IT IS HEREBY ORDERED THAT:

(A) Within 30 days of the effective date of this Order, the licensee shall (1) retain the services of an independent third party organization to perform unannounced audits of the licensed activities during each of the four calendar quarters in 1985, to verify that users of licensed material are adhering to NRC and procedural requirements of the licensee's radiation protection program, and (2) submit to the Regional Administrator, NRC Region I, a description of the organization retained, including the name(s) and resume(s) of the individual(s) who will perform the audits. This submittal shall also include statements from the individual(s) indicating that they presently are not and previously have not been employed by the licensee.

(B) Within 30 days of the date of completion of each of the four audits, the independent third party shall provide a report of the audit findings and

recommendations for corrective action, as appropriate, to the licensee's Hospital Administrator. A copy of each report, and any drafts provided to the licensee, shall be sent to the Regional Administrator, NRC Region I at the same time they are provided to the licensee.

(C) Within 30 days of the date of issuance of each report of the four audits by the independent organization, the licensee shall submit it's own report to the NRC Regional Administrator describing the actions taken to correct identified deficiencies and implement each recommendation made by the independent organization during each of the four audits, or provide justification if any specific recommendation is not adopted.

The Regional Administrator, NRC Region I, may relax or terminate any of the preceding conditions for good cause.

IV

The licensee or any other person whose interest is adversely affected by this Order may request a hearing on this Order. Any request for hearing shall be submitted to the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, within 30 days of the date of this Order. A copy of the request shall also be sent to the Executive Legal Director at the same address and to the Regional Administrator, NRC Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406.

If a hearing is to be held concerning this Order, the Commission will issue an Order designating the time and place of hearing. If a hearing is held, the issue to be considered at such hearing shall be whether this Order shall be sustained.

This Order shall become effective upon consent or, upon expiration of the time during which the licensee may demand a hearing or, in the event that the licensee demands a hearing, on the date specified in an order issued following further proceedings on this Order.

FOR THE NUCLEAR REGULATORY COMMISSION

James M. Taylor, Director
Office of Inspection and Enforcement

Dated at Bethesda, Maryland
this 5th day of March 1985

MIT IIT

FINDINGS AND CONCLUSIONS

ADVANCE COPY

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TEAM INTAKE ESTIMATE USING NUREG/CR-4884

- FROM WHOLE-BODY COUNT DATA -- 580 μCi
- FROM URINE ANALYSIS DATA -- 560 μCi
- WEIGHTED MEAN -- 570 μCi

UNCERTAINTY FACTORS

- URINE EXCRETION FRACTION
  (0.75-0.9) 570-680 μCi
- GEOMETRY FACTOR
  (0.5-0.65) 570-740 μCi
- ATOMIC NUMBER EFFECT
  (0.67-1.0) 380-570 μCi
- MODEL PARAMETERS
  520-620 μCi

RESEARCHER A MOST LIKELY INGESTED ^{32}P AS THE RESULT OF A DELIBERATE ACT BY A KNOWLEDGEABLE PERSON

- 50 μCi NORMALLY HANDLED
- ONLY STOCK SOLUTIONS UP TO 1000 μCi
- STOCK SOLUTION NEEDED TO BE THAWED
- NO TRACE OF CONTAMINATION IN WORK OR OTHER AREAS
- INVENTORY DISCREPANCY ABOUT 500 μCi
- SECURITY AND ACCOUNTING PRACTICES WOULD NOT DETECT MISSING MATERIAL

THE AMOUNT OF RADIOACTIVE MATERIAL INGESTED IS NOT EXPECTED TO RESULT IN ANY CLINICAL SYMPTOMS OR ACUTE EFFECTS

- NO SYMPTOMS BEFORE DISCOVERY
- SYMPTOMS REPORTED BY RESEARCHER ARE NOT OBSERVED FOR INTAKES 20-50 TIMES LARGER

THE SECURITY OF RADIOACTIVE MATERIALS IN STORAGE AND THE CONTROL OF RADIOACTIVE MATERIALS IN USE AT THE CENTER WERE WEAK

- CROWDED AREAS LIMITED LINE OF SIGHT
- STORAGE FREEZER UNATTENDED AND DID NOT HAVE A LOCK
- LABORATORY ACCESS NOT CONTROLLED AFTER NORMAL WORK HOURS
- NO RECORD OR OTHER CONTROLS FOR REMOVING MATERIAL FROM STOCK VIALS

THE RADIATION PROTECTION OFFICE EXERCISED WEAK OVERSIGHT WITH REGARD TO STORAGE AND CONTROL OF RADIOACTIVE MATERIAL IN USE IN UNRESTRICTED AND CONTROLLED AREAS

- MIT PROCEDURES DID NOT ADDRESS CONSTANT SURVEILLANCE
- AUDIT FORMS DID NOT LIST SECURITY OF MATERIAL AS A REVIEW ITEM
- ACTUAL SECURITY OF BUILDINGS AND LABORATORIES WAS DIFFERENT THAN BELIEVED BY RPO

NRC REGULATORY STANDARDS AND GUIDANCE FOR SECURITY AND CONTROL OF BYPRODUCT MATERIAL WERE INCONSISTENT

- 20.1801 AND 20.1802 DO NOT HAVE A LOWER LIMIT FOR QUANTITY OF MATERIAL
- PART 20 Q/As STATE 20.1801 AND 20.1802 WOULD NOT BE IMPOSED ON ALL QUANTITIES, HOWEVER SMALL
- 1995 TAR FOR NIH INDICATED LESS THAN APPENDIX C QUANTITY "NOT REGULATED" FOR THIS PURPOSE
- APPENDIX C QUANTITIES ARE SIMILAR TO EXEMPT QUANTITIES

DESPITE WEAKNESSES, THE LICENSEE'S OVERALL EMERGENCY RESPONSE WAS GOOD

- STRENGTHS
  - QUICK RESPONSE
  - PROMPT AREA SURVEYS
  - MULTIPLE METHODS OF BIOASSAY
  - SUSPENSION OF USE IN AFFECTED LABORATORY
  - PROMPT FOLLOWUP ACTIONS INVOLVING BIOASSAYS
- WEAKNESSES
  - EARLY URINE DATA UNRELIABLE DUE TO COLLECTION INSTRUCTIONS BEING MISUNDERSTOOD
  - INITIAL ASSESSMENTS WERE WEAK
  - CORRECTIVE ACTION LIMITED TO ONE LABORATORY

MANAGEMENT OVERSIGHT WAS WEAK

- PREVIOUS VIOLATION FOR FAILURE OF RADIATION PROTECTION COMMITTEE (RPC) TO DO 1993 AUDIT
- RPC MEMBERS DID NOT PERFORM AUDITS OF RADIATION PROTECTION PROGRAM
- RPC MEMBERS STATED THAT THEY DEPENDED ON THE RADIATION PROTECTION OFFICER TO INFORM THEM OF PROBLEMS AND PROGRAM STATUS

NRC REPORTING REQUIREMENTS WERE NOT SPECIFIC REGARDING INTENTIONAL CONTAMINATION AND NOT CLEAR FOR INTAKE. HOWEVER, LICENSEE HAD DATA INDICATING THE EVENT THREATENED TO CAUSE AN OVEREXPOSURE

- NO NRC REQUIREMENT TO REPORT DELIBERATE ACTS INVOLVING INGESTION OF RADIOACTIVE MATERIALS
- MEANING OF "DOSES RECEIVED WITHIN A 24-HOUR PERIOD"
- DATA AVAILABLE IN THE FIRST WEEK INDICATED A POSSIBLE INTAKE IN EXCESS OF 600 μCi

CONTRIBUTING CAUSES

- MIT'S PROGRAM FOR CONTROL AND SECURITY OF RADIOACTIVE MATERIALS WAS NOT EFFECTIVE TO DETER OR DETECT DIVERSION OF RADIOACTIVE MATERIALS

- THE NRC DID NOT HAVE REPORTING REQUIREMENTS IN PLACE TO COLLECT INFORMATION ABOUT DELIBERATE ACTS TO ASSESS EITHER THEIR FREQUENCY OR THE SEVERITY OF CONSEQUENCES

- THE NRC DID NOT DISSEMINATE INFORMATION ABOUT KNOWN PRECURSOR EVENTS AND DID NOT INFORM LICENSEES OF THE CIRCUMSTANCES OF A SIMILAR INCIDENT AT THE NATIONAL INSTITUTES OF HEALTH UNTIL 4 MONTHS AFTER THE INCIDENT WAS REPORTED