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Radioisotope Department Progress Report for December 1980

E. Lamb

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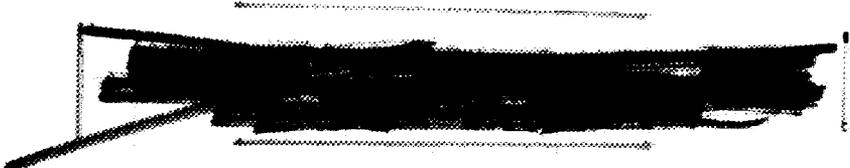
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OPERATIONS DIVISION

RADIOISOTOPE DEPARTMENT PROGRESS REPORT
FOR DECEMBER 1980

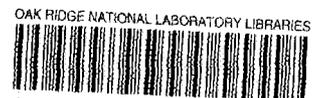
E. Lamb

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CONTENTS

SUMMARY	1
RADIOISOTOPE PRODUCTION AND MATERIALS	
Reactor Products Production	1
Iridium-192 Production	1
Cyclotron Service Irradiations	1
Cesium-137 Production	1
Strontium-90 Production	2
Short-Lived Fission Production	3
Krypton Enrichment Facility	4
Tritium Operations	4
Krypton-85 Operations	4
Packing and Shipping	5
Alpha Handling Facility	5
ISOTOPE TECHNOLOGY	
Radioisotope Technology	5
ISOTOPE SALES	7
PUBLICATIONS	
Reports	9

RADIOISOTOPE DEPARTMENT PROGRESS REPORT
FOR DECEMBER 1980

E. Lamb

Information is reported on new production inventory status, operational problems, and radioisotope sales.

RADIOISOTOPE PRODUCTION AND MATERIALS

Reactor Products Production (J. H. Moore)

<u>Processed Units</u>	
<u>Radioisotope</u>	<u>Amount (mCi)</u>
Calcium-47	18.5

Iridium-192 Production (J. H. Moore)

Twelve ORNL HFIR units (RB) containing 98,800 Ci of ^{192}Ir at HFIR discharge date were processed during the month of December 1980. Twenty-four shipments containing 163,400 Ci of ^{192}Ir were made during this period.

Cyclotron Service Irradiations (M. R. Skidmore)

During December 1980 the ORNL 86-Inch Cyclotron operated 10:30 hr for ORNL and Oak Ridge DOE programs for total charges of \$1,668. For the same period, operations were performed for non-ORNL programs for 268:15 hr for total charges of \$46,977. A target from cyclotron inventory was sold for \$2,454.

Operations for December were interrupted December 11-18 for repair of cracks in the dees and liner.

Cesium-137 Production (J. H. Moore - F. V. Williams)

The $^{137}\text{CsCl}$ product inventory follows.

Product Inventory

(Decay calculated through October 1, 1980)

<u>Inventory Material</u>	<u>Amount (Ci)</u>
Cesium-137 chloride powder	8,290
Total Inventory Material	8,290
 <u>Non-Inventory Material</u>	
Cesium-137 pollucite	14,500
Special form cans	23,700
Material returned or stored for customer	
J. L. Shepherd (powder and sources)	53,950
Gulf Nuclear	1,000
Puerto Rico Sources	7,400
Lockheed	18,300
AECL powder	49,100
Radiation Resources	12,100
Gamma Industries	7,800
Minn. Mining and Mfg. Co.	6,700
Isomedix (completed sources)	34,200
Total Non-Inventory Material	228,750
 TOTAL INVENTORY AND NON-INVENTORY MATERIAL	 237,040

Fabrication Summary

	<u>Dec. 1980</u>		<u>CY 1980</u>		<u>FY 1981</u>	
	<u>No.</u>	<u>Ci</u>	<u>No.</u>	<u>Ci</u>	<u>No.</u>	<u>Ci</u>
Sources						
Fabricated	0	0	116	140,200	0	0
Shipped	2	13,250	51	102,750	2	13,250
Special Form Powder Cans						
Fabricated	0	0	31	62,500	0	0
Shipped	1	10	7	1,570	3	1,100

Strontium-90 Production (R. W. Schaich)

There was no activity this period.

Product Inventory

(Decay calculated through October 1, 1980)

<u>Inventory Material</u>	<u>Amount (Ci)</u>
Stock powder cans	2,715
Stock solution	<u>160</u>
Total Inventory Material	2,875
<u>Non-Inventory Material</u>	
⁹⁰ Sr Titanate	13,370
⁹⁰ Sr Fluoride	4,490
New England Nuclear Corporation	130
Calorimeter Standards	3,690
Weather Bureau Source	10,500
SNAP-7B	144,900
SNAP-7C	22,770
SNAP-7D	132,240
SNAP material purchase	120,100
Georgia Inst. of Technology	<u>75</u>
Total Non-Inventory Material	452,265
TOTAL INVENTORY AND NON-INVENTORY MATERIAL	455,140

Fabrication Summary

	<u>Dec. 1980</u>		<u>CY 1980</u>		<u>FY 1981</u>	
	<u>No.</u>	<u>Ci</u>	<u>No.</u>	<u>Ci</u>	<u>No.</u>	<u>Ci</u>
Sources						
Fabricated	0	0	8	388,000	0	0
Shipped	0	0	8	388,000	0	0
Special Form Cans						
Fabricated	0	0	15	400	0	0
Shipped	0	0	1	70	1	25

Short-Lived Fission Production (H. Bailey)

The Short-Lived Fission Product process equipment was placed in a standby condition. The next process cycle is scheduled for January 1981.

Krypton Enrichment Facility (J. R. DeVore)

The krypton-85 thermal diffusion columns remained shut down during the reporting period. One hundred curies of 12.12% enriched krypton was shipped to customers.

Tritium Operations (H. Bailey)

Installation of the new tritium process system has been delayed due to the late delivery of special vacuum pumps.

Eleven gas cylinders and 14 nonreturnable containers were loaded with 52,800 Ci of tritium for shipment to customers.

An additional 82 Pyrex glass tubes were loaded with 2,300 Ci of tritium for the Terrestrial Radioisotope Development Program.

Krypton-85 Operations (H. Bailey)

Twenty-two gas cylinders were loaded with 680 Ci of normal and enriched ^{85}Kr for shipment to customers. The ^{85}Kr (normal and enriched) product inventory follows:

Product Inventory

(Decay calculated through November 30, 1980)

<u>Inventory Material</u>	<u>Amount (Ci)</u>
Normal krypton-85 (<4.5%)	<u>2,430</u>
Total Inventory Material	2,430
<u>Non-Inventory Material</u>	
Enriched krypton-85 (thermal diffusion columns)	1,700
Krypton-85 Light Source Development	<u>735</u>
Total Non-Inventory Material	2,435
TOTAL INVENTORY AND NON-INVENTORY MATERIAL	4,865

Packing and Shipping (R. D. Johnston)

One hundred fifty-one packages were processed and shipped during the reporting period. The total weight shipped was 95,781 kg.

<u>Radioactive Solid Shipments</u>	<u>Radioactive Gas Shipments</u>	<u>Radioactive Liquid Shipments</u>	<u>Empty Containers</u>	<u>Total</u>
79	46	26	0	151

Alpha Handling Facility (R. D. Johnston)

Two packages of alpha material were prepared for shipment this month. The quantity shipped was 50 g of ^{241}Am .

ISOTOPE TECHNOLOGY

F. N. Case

Radioisotope Technology

Gadolinium-153 production in December yielded 1.5 Ci. An order backlog for 5 Ci now exists, and we are informed that a new manufacturer of a bone density scanner and whole body scanner that will use ^{153}Gd sources has plans to make some 30 of these units per year. At our current rate of production of ^{153}Gd , such a marketing effort by the manufacturer will be difficult to satisfy. Further R&D efforts in the production of ^{153}Gd seem to be justified, especially since the radionuclide is unique because of its approximately 100 KeV gamma ray which is ideal for evaluation of density changes in body tissue.

One method that is promising for the separation of gadolinium from europium targets is by high temperature distillation of thorium-reduced europium. This method was demonstrated several years ago to prepare europium targets. If the equipment can be simplified for recovery of the gadolinium, it may be possible to eliminate the tedious extraction process now used.

Ytterbium-169 sources continue to be required for precision radiography. The major user of these sources, Babcock & Wilcox, returned a camera containing a new source because of an alignment problem in the source holder. On examination it was found that the rod onto which we attach the source was bent. A new holder was obtained from Technical Operations, who manufactured the camera, and the ytterbium source was transferred.

Runway marker signs for the Air Force and Navy, using tritium, are under test for physical properties under stress conditions. Approximately 200 individual tubes have been loaded with phosphor. After filling with tritium, these tubes will be assembled into a demonstration unit for evaluation at Tyndall Air Force Base late in January 1981.

Selenium-75 production for Mallinckrodt will be continued into 1981. Some R&D effort is required to determine the low yield obtained on the last run in which the irradiation time was calculated to be optimum. Burnup cross-section values may be in error. Process equipment needs to be optimized.

Special samples of ^{238}Pu were prepared for inhalation studies by the Health and Safety Research Division. The program will extend into 1981 to determine the observed difference in lung clearance of plutonium as related to the different isotopes.

A meeting was held with LASL and TWSO personnel to discuss instrumentation support for scanning TRU waste stored in drums. The effort will provide a better knowledge of the ORNL TRU waste inventory and identity of TRU isotopes present.

HFIR target loading and testing for ^{192}Ir , service irradiations, and for processed radioisotopes continued at a normal rate during December. Stable isotope packing and shipping is current.

ISOTOPE SALES

J. E. Ratledge

Significant sales of radioisotopes, non-EM stable isotopes, and heavy elements made this month are shown in Table 1.

Table 1. Radioisotope and non-EM stable isotopes selected data

Customer	Isotope	Quantity
<u>Large Quantities</u>		
Central Bureau for Nuclear Measurements, Belgium	Americium-243	200 mg
Gulf Nuclear, Incorporated	Cesium-137	56,044 Ci
Nuclepore Corporation	Uranium-235	150 g
Nuclear Material Control Center, for Japan	Plutonium-242	1 g
<u>Withdrawn Items</u>		
New England Nuclear	Gallium-67	192 Ci
Technical Operations, Inc.	Ytterbium-169	5 Ci

Sales of all isotopes and services in December totaled \$711,828, distributed as follows:

	<u>Revenue</u>	<u>No. of Shipments</u>
Radioisotopes	\$382,487	130
Non-EM Stable Isotopes	5,002	9
EM Stable Isotopes	125,461	139
Heavy Elements	<u>198,878</u>	<u>19</u>
Total Isotopes & Services	\$711,828	297

A comparison of FY 1981 sales to date with a comparable period in FY 1980 is given in Table 2.

Table 2. Isotope Sales summary

Item	Revenue 10/1/79 - 12/31/79	Revenue 10/1/80 - 12/31/80	Net Difference
<u>Radioisotopes</u>			
Tritium	\$ 172,535	\$ 160,004	\$(12,531)
Other Inventory Items	2,449	7,622	5,173
Krypton	59,394	89,466	30,072
Iridium-192	424,954	345,061	(79,893)
Carbon-14	0	9,290	9,290
Cobalt-60	0	0	0
Other Major Products	71,950	57,456	(14,494)
Misc. Processed Materials	1,491	21,941	20,450
Cyclotron Irradiations	127,863	182,940	55,077
Handling Charge	42,950	46,880	3,930
Other Services	88,087	183,865	95,778
Total	\$ 991,673	\$1,104,525	\$112,852
<u>Non-EM-Stable Isotopes</u>			
Boron-10 and -11	\$ 180	\$ 231	\$ 51
Lithium-6 and -7	18,815	4,928	(13,887)
Other Products	0	0	0
Service	4,350	6,050	1,700
Total	\$ 23,345	\$ 11,209	\$(12,136)
<u>EM Stable Isotopes</u>			
Products	\$ 318,865	\$ 333,116	\$ 14,251
Services	58,825	37,864	(20,961)
Total	\$ 377,690	\$ 370,980	\$ (6,710)
<u>Heavy Elements and OSM</u>			
Americium-241	\$ 101,866	\$ 447,163	\$345,297
Uranium-234	33,345	5,161	(28,184)
Neptunium-237	1,843	15,470	13,627
Other Products	89,590	138,293	48,703
Services	38,940	96,325	57,385
Total	\$ 265,584	\$ 702,412	\$436,828
Grand Total	\$1,658,292	\$2,189,126	\$530,834

PUBLICATIONS

Reports

E. Lamb, *Radioisotope Department Progress Report for November 1980*, ORNL/TM-7676 (January 1981).

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