ORNL/TM-6244

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Radioisotope Distribution Program Progress Report for December 1977

E. Lamb

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Contract No. W-7405-eng-26

OPERATIONS DIVISION

RADIOISOTOPE DISTRIBUTION PROGRAM PROGRESS REPORT FOR DECEMBER 1977

E. Lamb

Work Sponsored by
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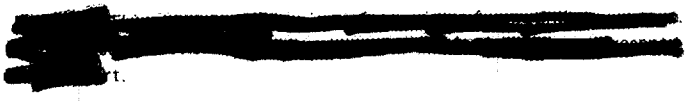
Date Published - February 1978



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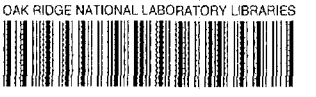

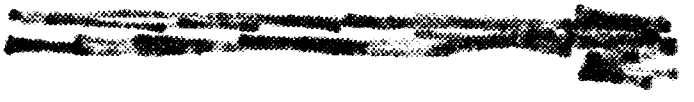

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RADIOISOTOPE DISTRIBUTION PROGRAM
PROGRESS REPORT FOR DECEMBER 1977

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SUMMARY

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

RADIOISOTOPE PRODUCTION AND MATERIALS

REACTOR-PRODUCED RADIOISOTOPES

Reactor Products Production (*R. W. Schaich*) (Production and Inventory Accounts)

Processed Units	
Radioisotope	Amount (mCi)
Calcium-47	23

Iridium-192 Production (*R. W. Schaich*)

The first production grade ^{192}Ir was discharged from the HFIR on November 23, 1977. A total of seven customer irradiation units were processed, monitored and shipped. The units yielded 28,730 curies as of November 23, 1977, with a maximum of 540 curies per gram for thin wafers. Pellets (1/16-in. by 1/32-in.) averaged 280 curies per gram. An additional five ORNL RB-type irradiation units containing 21,300 curies of ^{192}Ir were processed, monitored and shipped. These units were irradiated in the RB positions (1×10^{15} $n/cm^2 \cdot sec$) and contained thin wafers of iridium metal and averaged 520 curies of ^{192}Ir per gram of material. This yield is lower than expected for two-thirds cycle in the HFIR due to lower specific activity on both ends of the irradiation unit. Preliminary data on the RB material irradiated one full cycle and discharged during the HFIR shutdown of December 16, 1977 indicates 700 curies of ^{192}Ir per gram of iridium metal at discharge. These units were loaded in the central portion of the irradiation tube and the specific activity was more uniform. Complete data on these units will be reported next month.

The ^{192}Ir wafer monitoring instrument was calibrated using GE pre-calibrated wafers. It was found necessary to recheck the GE-supplied wafers by in-air ionization chamber measurements. The curie contents of additional wafers were also determined by these ionization chamber measurements to provide sufficient points on the calibration curve of the monitoring instrument.

A price of $1.50 per curie of ^{192}Ir based on curie content ten days after shipping date was recommended by ORNL and approved by DOE/ORO. Shipments to

customers were initiated the first week of December in customer-furnished casks, most of which were leased from GE. Three ORNL casks were upgraded by fabricating and installing a tungsten insert to provide sufficient shielding for 4300-curie shipments of ^{192}Ir. Additional ORNL casks will be modified in this manner during the next two months.

The production data obtained so far indicate that two HFIR cycles are optimal for GETR-type capsules irradiated in VXF positions and one HFIR cycle in the RB positions. Customer acceptance of the higher specific activity material from RB-type capsules is very good. The only production rate problem appears to be in the thicker pellets (1/16-in. by 1/32-in.), in which the specific activity of ∿300 Ci/g obtained after two cycles is lower than that provided by GE. This effect may be due to the lower epithermal-to-thermal flux ratio in the HFIR compared to the GETR.

Additional GETR-type capsules were acquired from GE-Vallecitos to be irradiated on customer's demand. A batch of 5000 iridium wafers, 0.107-in. by 0.011-in., was fabricated by ORNL for use in future RB capsule irradiations.

Other GETR Products and Services (*E. Lamb*)

A Japanese company requested a quotation on 35 Ci/week of neutron-produced ^{99}Mo. Calculations indicated that 39 Ci/g of molybdenum could be produced during a 7-day irradiation in the HFIR hydraulic tube. An experimental irradiation of molybdenum metal samples resulted in 18 Ci/g after three days and 25 Ci/g after seven days. These data prove that short-term irradiations to provide good specific activity and sufficient quantities of ^{99}Mo are feasible in the HFIR hydraulic tube. A quotation was made but no reply has been received.

Inquiries have been received from New England Nuclear and Amersham-Searle regarding the availability of ^{63}Ni from ORNL. They have been referred to GE-Vallecitos on the basis of an avowed inventory of ^{63}Ni sufficient to last through July 1978. We will, however need to begin the irradiation of enriched ^{62}Ni targets by February 1978 if NRC continues to withhold approval for the GETR startup. About nine months would be required to produce 12 Ci/g ^{63}Ni in an RB position, but limited quantities can be produced in about three months in the hydraulic tube.

Lloyd Hansen of GE-Vallecitos visited on December 13, 1977 to discuss the possibility of irradiating several ^{60}Co targets which have previously been irradiated in the GETR to 300 Ci/g. About six months would be required to increase the specific activity to 400 Ci/g in a HFIR VXF position. The capsules would have to be subjected to the prescribed pressure and leak tests using remote equipment at ORNL. We indicated the irradiation would be feasible and advised him to submit a purchase order.

ACCELERATOR-PRODUCED ISOTOPES

Cyclotron Service Irradiations (*M. R. Skidmore*) (Production and Inventory Accounts)

December 1977 ORNL 86-Inch Cyclotron runs for ORNL and non-ORNL programs are given in Table 1.

Table 1. Cyclotron Irradiations and Runs for December 1977

Date	Customer	Product	Target	Total Time (hr:min)	Total Charges
		ORNL Programs			
12- 1-77	ORAU	Carbon-11	Boron Oxide	6:15	$ 745
12- 8-77	ORAU	Carbon-11	Boron Oxide	7:00	831
12-13-77	M.W. Poore, Y-12	Cobalt-56	Iron	6:15	971
12-16-77	ORAU	Carbon-11	Boron Oxide	6:45	802
12-28-77	ORAU	Carbon-11	Boron Oxide	7:15	860
				33:30	$ 4,218
		Non-ORNL Programs			
12- 6-77	New England Nuclear	Gallium-67	Zinc-68	29:15	$ 4,580
12-13-77	New England Nuclear	Gallium-67	Zinc-68	25:15	3,980
12-19-77	New England Nuclear	Gallium-67	Zinc-68	25:15	3,980
12-20-77	New England Nuclear	Germanium-68	Gallium	15:15	2,579
12-26-77	New England Nuclear	Gallium-67	Zinc-68	25:15	3,980
				120:15	$19,099

Two runs were interrupted due to a shorted ion source and one run was interrupted due to the malfunctioning of cubicle 96 in the oscillator circuit. A short burner and controls, for burning shorts in the ion source, has been installed outside of the pit. This outside installation will reduce radiation exposure to personnel, reduce down time, and has improved safety features.

FISSION PRODUCTS

Krypton-85 Enrichment Facility (*R. W. Schaich*)

One ^{85}Kr enrichment column was operative during the month of December and the unit functioned according to design. The three columns in the south bank are shut down due to a shortage of manpower to check out the system. A tentative schedule calls for checking and loading the south bank in January 1978.

Cesium-137 Pilot Production (*R. W. Schaich*)
(Production and Inventory Accounts)

1. Process Status

The ^{137}Cs processing equipment has been placed in standby status.

2. Operational Summary

Product Inventory

(Decay calculated through August 31, 1977)

Inventory Material	Amount (Ci)
Cesium-137 chloride powder	29,960
Total Inventory Material	29,960

Non-Inventory Material	Amount (Ci)
Special Form Cans	4,300
Material returned or stored for customer	
Nuclear Research Corporation	0
J. L. Shepherd	50,600
New England Nuclear Corporation	2,500
Puerto Rico Sources	7,900
Lockheed	19,600
AECL powder	71,500
Radiation Resources	19,800
Minn. Mining & Mfg. Company	2,800
Gamma Industries	8,400
Total Non-Inventory Material	187,400
TOTAL INVENTORY AND NON-INVENTORY MATERIAL	217,360

Fabrication Summary

	Dec. 1977		CY 1977		FY 1978	
	No.	Ci	No.	Ci	No.	Ci
Sources						
Fabricated	0	0	14	16,926	0	0
Shipped	0	0	17	35,555	0	0
Special Form Cans						
Fabricated	0	0	2	2,055	1	5
Shipped	0	0	17	7,800	4	200

3. Current Orders

All orders on hand have been completed and the material placed into storage awaiting receipt of release for the material.

Strontium-90 Pilot Production (*R. W. Schaich*)
(Production and Inventory Accounts)

1. Process Status

The ^{90}Sr source fabrication equipment has been placed in standby status.

Product Inventory

(Decay calculated through August 31, 1977)

Inventory Material	Amount (Ci)
^{90}Sr titanate powder (±5%)	0
Sources in fabrication	0
Stock powder cans	3,325
Stock solution	200
Total Inventory Material	3,525

Non-Inventory Material	Amount (Ci)
Batch 26Sr-74RE	7,900
Calorimeter Standards	4,800
Weather Bureau source	11,400
SNAP-7B	156,300
SNAP-7C	24,600
SNAP-7D	143,000
SNAP material purchase[a]	248,300
AGN-4 Powder	38,400
Total Non-Inventory Material	634,700
TOTAL INVENTORY AND NON-INVENTORY MATERIAL	638,225

[a]Strontium-90 purchased under DRRD program.

Fabrication Summary

	Dec. 1977		CY 1977		FY 1978	
	No.	Ci	No.	Ci	No.	Ci
Sources						
Fabricated	0	0	3	157,000	0	0
Shipped	0	0	4	177,000	0	0
Special Form Cans						
Fabricated	0	0	0	0	0	0
Shipped	0	0	2	20	0	0

Short-Lived Fission Product Production (*R. W. Schaich*) (Production and Inventory Accounts)

The production of short-lived fission products is listed in the table below.

Isotope	Number of Batches	Amount (Ci)
Xenon-133	4	3000
Iodine-131	1	75

Xenon-133 Production (*E. Lamb*)

The weekly processing schedule of ^{133}Xe resulted in batches of 600-800 Ci as of process date. The shipments are averaging 200 Ci/week with one customer receiving 150 Ci/week in a single shipping cylinder. On the basis of ORNL recommendations for the pricing of ^{133}Xe, ORO approved the deletion of the $15/Ci handling charge for bulk cylinder shipments effective in December 1977 and a $60/Ci price for January 1-March 31, 1978. This price is equivalent to the present commercial price.

RADIOISOTOPE SALES

J. E. Ratledge

Shipments made during the month that may be of interest are listed below:

Customer	Isotope	Amount
Large Quantities		
New England Nuclear Corporation	Tritium	10,000 Ci
Self-Powered Lighting, Ltd.	Tritium	7,000 Ci
Radiochemical Centre Ltd., England	Tritium	15,000 Ci
Merz and Benteli Nuclear, Switzerland	Tritium	15,000 Ci
Brandhurst Company, Ltd., Germany	Tritium	5,000 Ci
Radium-Chemie, Ltd., Switzerland	Tritium	15,000 Ci
American Atomics Corporation	Tritium	40,000 Ci
Saunders-Roe Developments, England	Tritium	15,000 Ci
ICN Pharmaceuticals	Tritium	1,000 Ci
Withdrawn Items		
Gulf Nuclear Inc.	Iridium-192	7,981 Ci
Industrial Nuclear Company	Iridium-192	7,190 Ci
Automation Industries, Inc.	Iridium-192	8,469 Ci
Technical Operations, Inc.	Iridium-192	38,802 Ci
Gamma Industries	Iridium-192	5,984 Ci
Source Production and Equipment Co., Inc.	Iridium-192	2,120 Ci
Items Used in Cooperative Programs		
University of Southern California	Platinum-195m	10 mCi

The radioisotope sales and shipments for the first three months of fiscal year 1977 and fiscal year 1978 are given in Table 2.

Table 2. Radioisotope Sales and Shipments

Item	10-1-76 thru 12-31-76	10-1-77 thru 12-31-77
Inventory items	$ 71,013	$ 286,279
Major products	27,154	104,783
Radioisotope services	57,688	54,385
Cyclotron irradiations	116,842	92,866
Miscellaneous processed materials	20,039	36,903
Packing and shipping	47,634	48,425
Total	$ 340,370	$ 623,641
Number of shipments	602	579

PUBLICATIONS

REPORTS

E. Lamb, *Radioisotope Distribution Program Progress Report for November 1977*, ORNL/TM-6243, Oak Ridge National Laboratory (January 1978).

ORNL/TM-6244

INTERNAL DISTRIBUTION

1. F. N. Case
2. W. R. Casto
3. J. A. Cox
4. R. F. Hibbs
5. E. Lamb
6. H. H. Nichol
7. C. L. Ottinger
8. J. K. Poggenburg
9. H. Postma
10. M. E. Ramsey
11. J. E. Ratledge
12. C. R. Richmond
13. R. W. Schaich
14. M. R. Skidmore
15. M. J. Skinner
16-17. Central Research Library
18-19. Laboratory Records Department
20. Laboratory Records - RC
21. Document Reference Section

EXTERNAL DISTRIBUTION

22. B. J. Dropesky, LASL, Los Alamos, New Mexico
23-24. J. H. Jarrett, PNL, Richland Washington
25. D. K. Jones, Richland Operations Office, Richland, Washington
26. J. N. Maddox, DOE-DBER, Washington, D.C.
27. H. A. O'Brien, LASL, Los Alamos, New Mexico
28. F. J. Skozen (Krizek), Argonne Cancer Research Hospital, Chicago
29. L. G. Stang, Jr., BNL, New York
30. W. H. Weyzen, DOE-DBER, Washington, D.C.
31-32. R. W. Wood, DOE-DBER, Washington, D.C.
33. Donner Laboratory Library, Univ. of California, Berkeley, Calif., 94720
34. Research and Technical Support Division, ORO
35-36. Technical Information Center