

SECRET

[REDACTED]

715866

P-48-A

Contract No. W-7405-eng-48-A

* * *

PROGRESS REPORT FOR THE MONTH OF APRIL 1945

Joseph G. Hamilton, M. D.

April 14, 1945

REPOSITORY NARA - WASH DC
COLLECTION ANL & U OF CHI - MET LAB
BOX No. 6(24-2) NN3-77-85-1
FOLDER MAR-MAY 1945

CLASSIFICATION CANCELLED
DATE AUG 21 1962
For the Atomic Energy Commission
TED RIDMON *[Signature]* for the
Chief, Declassification Branch

Manuscript Received: May 18, 1945
Report Received: May 21, 1945
Issued: MAY 23 1945

1099770

SECRET

This document contains information affecting the National defense of the United States within the meaning of the Espionage Laws, Title 18, United States Code, Sections 793 and 794, and the transmission or revelation of its contents in any manner to an unauthorized person is prohibited by law.

PART I

SUMMARY

A. Metabolic Studies of Fission Products

A large number of pea plants were harvested that had been grown in W top-soil containing from 0.1 to 0.2 microcuries per gram of Sr, Y, Zr plus Cb, and Ce. The most significant observation is that marked destruction of the roots took place, presumably from radiation effects. Plant studies with carrier-free radio-Tellurium show this material to be selectively deposited in the roots to a very high degree. Radio-Tellurium is absorbed very effectively by clay and in this respect resembles the corresponding behavior of the alkaline earths, rare earths, Zirconium and Columbium. An investigation of the blocking action of inert Iodine in reducing the uptake of I^{131} by the thyroid gland has been started. A single dose of 100 mgms. of inert Iodine reduces the uptake of I^{131} , when both Iodine isotopes are given simultaneously, to from 0.2% to 0.3% of the administered amount of radio-Iodine.

B. Metabolic Studies of Product

Further study of the Product bone radio-autographs have conclusively substantiated our opinion that the primary regions of deposition are in the endosteum and cancellous bone. There appears now to be a strong probability that the chief site of localization of Product in bone occurs in the osteoblasts of the endosteum.

A series of tracer studies up to and including 16 days following the inhalation of Product aerosols containing fission products have been completed. The product was exposed to prolonged neutron irradiation in the CP-3 Pile and the PuO_2 aerosols from this material were produced by the usual technique of burning the metal in a carbon arc. The relative ratio of deposition of fission product activity and Plutonium activity in the animals exposed to this smoke mixture shows minor differences. The long term PuO_2 and $PuO_2(NO_3)_2$ aerosols studies are being continued.

C. 60" Cyclotron at Berkeley

The Cyclotron operated quite well during the first fifteen days of April. Beam currents of up to 40 microamperes of 20 MEV deuterons and 4 microamperes of 40 MEV alpha particles were obtained. A major failure occurred April 15, 1945, when the connections between the liners of the Cyclotron vacuum chamber and the Dee stem tank liners burned. The rest of the month was devoted to repairing the results of this accident. This job was completed by the end of the month and the instrument is ready to start up operation again.

D. The estimated expense for April 1945 is \$9,450.00 as compared to \$7,976.97 for March. Personnel increased from 19 to 20.

SECRET

SECRET

[REDACTED]

PART II

A. TECHNICAL PROGRESS REPORT ON THE METABOLIC STUDIES OF FISSION PRODUCTS

1. Soil Studies

On April 2, 1946, pea plants which had been grown in active W topsoil were harvested. The plants were approximately three months old. Soils activated with the following radio-elements had been used in the experiment: Y, Ce, Zr + Cb, and Sr. Each plant was grown in a pot containing 2.5 kg. of soil. The mean activities of the various soils for the three months period was as follows:

Y	-	.145	μ c/gm
Ce	-	.212	μ c/gm
Zr + Cb	-	.125	μ c/gm
Sr	-	.166	μ c/gm

The plants have been separated into roots, stems, leaves, pods, and seeds and quantitative determinations of activity are being made. Qualitatively it can be said that all plants showed radiation injury. This was particularly marked in the case of both the roots and tops of the Sr plants. This was probably due to the large absorption of Sr by the plants. The Y, Ce, and Zr + Cb plants showed definite signs of root injury, particularly the Ce plants.

A sample of radio-tellurium was received from X-10 and purified. The absorption of Te* from clay by barley plants was studied. Barley plants were immersed for 24 hours in 0.01% Ca-bentonite suspensions containing radio-tellurium. The fractional uptake of activity was as follows:

<u>Number</u>	<u>% Activity in Leaves</u>	<u>% Activity in Roots</u>
1	.0472	31.2
2	.0397	41.8
3	.0377	38.5

On the basis of these results, it appears that the behavior of Te is similar to that of Y and Ce in its absorption by plants. Longer term experiments are in progress. The absorption of radio-tellurium on Ca bentonite clay was measured with the following results:

1099772

<u>Conc. of Clay Suspension (%)</u>	<u>% of Activity Adsorbed</u>
.01	30.2
.02	65.8
.05	81.1
.10	87.0
.50	89.8

These results show that Te is similar to Sr in its adsorption on clay although its absorption by plants from clay suspensions is markedly different from that of Sr.

Experiments dealing with the decontamination of active soils and the migration of radio-elements in soil are being continued.

[REDACTED]

SECRET

[REDACTED]

2. Radio-Iodine Studies

Recent studies were undertaken to determine the blocking effect of inert Iodine upon the uptake by the thyroid gland of I^{131} , free from inert carrier. Rats were the experimental animals employed in these studies, there being three animals used for each group. Two series of experiments were done, employing four groups of rats for each series. Three dosage levels of the inert Iodine were used, namely 1, 10, and 100 mg. per kg. of body weight. In each series, a fourth group received only the carrier-free Iodine and thus served to act as a control. The inert Iodine and carrier-free Iodine were given by intramuscular injection at the same time, the animals sacrificed four days later, and the thyroids assayed for their uptake of I^{131} . The following table summarizes the average results obtained in these two series of experiments.

TABLE I

The % Uptake of I^{131} by the Thyroid Gland of the Rat, 4 Days After the Intramuscular Administration of Carrier-free I^{131} and, I^{131} Containing 1, 10, and 100 mgm per kg. of Body Weight.

	<u>Carrier-free</u>	<u>1 mgm I^{127} kg.</u>	<u>10 mgm I^{127} kg.</u>	<u>100 mgm I^{127} kg.</u>
Series A	4.82	2.06	.96	.20
Series B	7.45	3.06	.99	.32

As can be seen from the table, a very sharp decrease in the amount of Iodine accumulated by the thyroid takes place as the dosage of inert Iodine increases. However, it is rather significant that even with as much as a 100 mg. of inert Iodine per kg. a quite significant amount of the labeled Iodine is capable of entering the thyroid gland. Another interesting observation is to be made from these results, namely, that the amount of Iodine taken up by the thyroid of the animals receiving no inert Iodine is surprisingly low when compared to figures given by Chaikoff (CH-2257). These relatively low uptakes by the thyroid of carrier-free Iodine are comparable to the figures secured at Chicago in studies where carrier-free Iodine was administered by inhalation. We suspect that this factor is due to the possible presence of quite appreciable quantities of Iodine in the diets employed here and at Chicago. The uptake observed in the other groups receiving varying amounts of inert Iodine agree surprisingly well with the compiled data given in CH-2257. We are now setting up new groups of animals which will receive at weekly intervals the three dosage levels of inert Iodine employed here for a period of four weeks. One week after the last administration of inert Iodine, the animals, together with the appropriate number of controls, will be given the carrier-free Iodine. These experiments are being set up for the purpose of determining the blocking effect of repeated doses of inert Iodine. This will duplicate the situation which would normally exist where personnel exposed to this substance would be given prophylactic protection by the administration of inert Iodine.

3. Smoke Studies

A series of smoke studies, in which aerosols containing fission

[REDACTED]



product have been produced by a new procedure, are reported in another section. In addition to these experiments, a series of studies are now under way in which Uranium-free fission products without inert carriers, will be volatilized by means of a carbon arc and rats exposed to the resultant aerosol in the usual manner.

4. Projected Studies

The soil, smoke, plant, and radio-Iodine studies are to be continued.



1099774

[REDACTED]

PART II

B. TECHNICAL PROGRESS REPORT ON THE METABOLIC STUDIES OF PRODUCT

1. Radio-autographic Studies

Further examination of bone radio-autographs have made several previous deductions more secure. In the first place, we now feel very convinced that no perceptible differences in the microscopic distribution of Product in bone occurs between the three principle valence states of Plutonium. Secondly, we now feel that there is no question but that the two principle regions of deposition of Product in the bone takes place in the region of the endosteum and the cancellous portion of the bone. The periosteum almost invariably contains many times less Product than does the region adjoining the endosteum. We have attempted to pursue this problem further to ascertain more exactly the areas of deposition of Product in the endosteum. To date, the evidence that Product is deposited primarily within the osteoblasts is not completely established. However, it does appear very likely that this cellular structure has the greatest degree of accumulation of Product. In several of the radio-autographs taken from rachitic bones, it would appear that the bulk of the Product is laid down in the endosteal covering of the cancellous bone and not within the bony spicules themselves. To date, we have not been able to make the same observation with normal bone. This is probably due to the fact that the resolution of the radio-autographs from normal bone is generally much poorer than that from the rachitic bones since it is much more difficult to cut 10 micron sections of uniform thickness from the former histological material. Two reproduced radio-autographs, together with photomicrographs of the corresponding sections are included in this report.

2. Tracer Studies

The tracer studies with $\text{PuO}_2(\text{NO}_3)_2$ are being continued with the longer period animals.

In the following table there is summarized the more salient data obtained by exposing large groups of rats to PuO_2 aerosols produced by burning neutron irradiated Plutonium metal which contained fission products.

TABLE I

The Distribution of Fission Products and Product in Rats Following the Inhalation of PuO_2 Smoke Produced By Burning Neutron Irradiated Plutonium Metal in a Carbon Arc

(Time in Days)

Tissue	0		4		16	
	Pu	F.P.	Pu	F.P.	Pu	F.P.
Lungs	36.3	38.1	63.5	54.8	11.1	16.9
Liver	.070	.26	.22	.20	.026	.039
Kidney	.018	.20	.14	.13	.026	.036
Spleen	.050	.014	.11	.048	.050	.017
Head	30.1	32.0	6.34	2.50	.23	.29
Skeleton	1.78	2.35	1.97	6.60	.22	1.86
Urine			5.87	11.9	1.73	4.20
Feces			20.1	16.7	89.5	81.5

1099775



The data presented indicates the respective uptake and deposition of the Alpha and Beta activities in the listed tissues. Examination of these results brings to light several interesting facts. First, the uptake by the skeleton of the fission products is considerably greater than in the case of product. It is also greater than has been observed earlier following the inhalation of UO_2 aerosols containing fission products. The factor of higher absorption of fission products as compared with product across the alveolar tissue, does not manifest itself as consistently when one compares the two types of activities in the soft tissue. The activities in the soft tissue are not large and probably are of little practical significance. The quite low content of both product and fission products in these soft tissues makes exact quantitative measurements quite difficult. Differences in the ratios of Alpha to Beta activity in those tissues sufficiently radioactive to permit accurate measurements indicates a significant deviation at the 4 and 16 day time intervals as compared to the 0 interval. More data must be accumulated before a detailed interpretation may be made.

As a result of a misunderstanding, the sample of Pu^{238} which was in the possession of Dr. Latimer's group, contained less of this isotope than we had originally understood it to possess. Due to this fact, it will not be possible for us to employ this particular sample for a human metabolic study. As a result of this we plan to devote several days of the output of the 60" Cyclotron for the production of Pu^{238} . We have recently received a report concerning the yield of Pu^{238} from Dr. Seaborg and his group at Chicago, and they inform us that it is approximately 7 microcuries per 1,000 micro-ampere hours. This figure signifies that the probable production of Pu^{238} from one week's operation of the instrument will approximate, in terms of equivalent activity, 300 micrograms of Pu^{239} .

3. Decontamination Studies

These long term experiments are being continued and at the moment the final results must await completion of the large number of assays now in progress.

4. Projected Studies

For the last two months, radio-autographs, smokes, decontamination, and human studies will be continued.





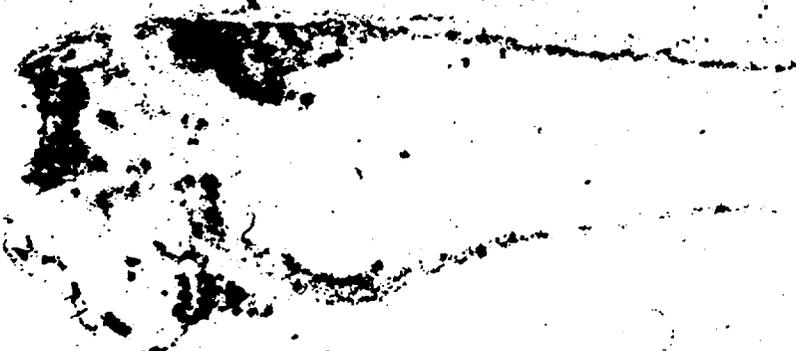
This document contains information concerning the National
defense of the United States and is being furnished to you
under the provisions of the Espionage Laws, Title 18, U.S.C.
Sec. 793 and 794, and the Espionage Laws, Title 50, U.S.C.
Sec. 2381, which prohibit the communication of such information
in any manner to an unauthorized person, who by so doing
may be prejudicial to the national defense.



1099777

RI Copp RE 14 Femur (x 11 diameters)





This document contains information affecting the National
defense of the United States within the meaning of the
Espionage Act, Title 18, Section 793, and the
or the transmission or revelation of its contents in any
unauthorized person is prohibited by law.

1099778

RE 14 + 3 256 day recovery period Femur (x 8,5 diameters)



PAGE II

60" CYCLOTRON ACTIVITIES, BERKELEY, CALIFORNIA, APRIL 1945

Section C.

During the first fifteen days of April the 60" Cyclotron was in operation for 280 hours. Throughout this interval, operation was somewhat steadier than it had been during the month of March and a significant increase in efficiency was achieved in these two weeks. The values given in previous months for the power input in to the main oscillator are all too low by a factor of approximately 25%. This is due to the fact that we recently discovered that certain of the meters that we had received were not properly calibrated. Steady 20 MEV deuteron currents were obtained up to 40 microamperes with a power input of approximately 125 KW. Steady 40 MEV alpha particle beams of 3 microamperes were obtained with approximately 120 KW input. At one time, up to 4 microamperes of alpha particles was obtained using approximately 140 KW input but this was associated with quite unsteady operation and excessive sparking in the tank. It should be kept in mind that these values for power input to the main oscillator, were obtained with the correctly calibrated meters.

At the end of this two week interval, a major breakdown occurred due to the melting through of the connections between the liner of the vacuum chamber and both Dee stem tank liners. This system serves as the ground return for very large radio-frequency currents, which are estimated to range up to 4,000 amperes at the point where the failure occurred. In order to install a more rugged system for connecting the liners of the vacuum chamber to those of the Dee stem tanks, it was necessary to remove the Dees and expose the terminal ends of the Dee stem liners. Adequate repair was not possible without removing the Dees due to the small space available for working in this region. At the same time that this essential repair was undertaken, it was possible to complete quite a number of other jobs, which needed attention, without extending the repair interval. These items include, replacement of the top feeler for the East Dee which had become badly eroded resulting from prolonged use of Alpha particles in the Cyclotron; the installation of circular blocks inside the Dee stem liners so as to provide for better contact between the grounding spiders and the Dee stem liners; the installation of a shielded booster oscillator transmission line so as to put an end to a considerable amount of stray RF leakage about the building which was undesirable for many reasons, including that of producing undue radio interference; installation of a new deflector and exit strip; repair of the West grounding spider which had given considerable trouble in the past; installation of a new type grid bias for main oscillator which should increase the oscillator efficiency by approximately 5 to 8 percent and also afford better protection for the main oscillator tube against heavy electrical surges; and installation of adequate cooling for vacuum chamber back plate. Most of these secondary jobs represent an accumulation of minor problems during the past few months for which something had to be done eventually, and the breakdown as a result of the Dee stem tank liners burning out, presented an admirable opportunity for their correction.

1099779

The last few days of the month were devoted to reassembly, pumping down, leak hunting, adjustments, and caking in the tank. Both grounding spiders were set three inches further up than their previous position in order to reduce the heating around this region. It was soon observed that our heating problems, about both the vacuum chamber and the Dee stem tanks, largely vanished as a result of the various repairs noted above. It is anticipated that within the next few days, the instrument will again be in operation.

Bombardments for the past month included 97.8 microampere hours of Alpha particles on Uranium for Dr. Seaborg and his group in Chicago, 2,053 microampere hours of deuterons on Thorium to produce U^{232} for the Health Group in Chicago, 60 microampere hours of deuterons on Rubidium to prepare Sn^{85} for the use of Project W-A, and 55 microampere hours of deuterons on Boron for the production of C^{11} for Dr. John Lawrence and his group at Berkeley.

PRIVACY ACT MATERIAL REMOVED

PART III

Re: W-7405-eng-48
Report on NDP-48A

Expense of Project 48A in April, 1945, is estimated as follows:

Payroll	\$ 3,600.00
Overhead	<u> </u>
Expense and Equipment	<u>4,950.00</u>
Total	<u> </u>

Following is a budget estimate for May and June, 1945:

Payroll	\$ 8,000.00
Overhead	<u> </u>
Expense and Equipment	<u>10,000.00</u>
Total	<u> </u>

Personnel at April 30, 1945, included the following:

Biochemist P-3	1
" P-6	1
Biologist P-3	1
Chemist P-3	1
" P-4	1
Physiologist P-3	2
Laboratory Technicians	6
Jr. " "	5
Clerk	1
Secretary	<u>1</u>
Total	<u>20</u>

1099781



PRIVACY ACT MATERIAL REMOVED

ESTIMATED STATUS OF NDP-USA
ON APRIL 30, 1945

Payroll:

Appropriation		\$ 99,000.00
Payroll to March 31	\$ 79,600.00	
April payroll	<u>3,600.00</u>	
		<u>63,200.00</u>
Balance		\$ 15,800.00

Overhead:

Appropriation		24,750.00
Overhead to March 31		
April overhead		
		<u>20,800.00</u>
Balance		

Expense and Equipment:

Appropriation		76,450.00
Expense to March 31	51,800.00	
April expense	<u>4,950.00</u>	
		<u>56,750.00</u>
Balance		<u>19,700.00</u>
TOTAL BALANCE		<u>\$ 39,450.00</u>

Total Appropriation	\$ 200,200.00
Total Expense	<u>160,750.00</u>
Total Balance	<u>\$ 39,450.00</u>



REPORT NO: P-48-A
 This document consists of 11
 pages of text and 2 pages of
 figures. This is copy 10 of
10 copies. Series B.



RECEIVED BY: A.H. Compton

5/23/45

Univ. of Calif.
Project Report April 1945

SECRET
Classification
<u>P. Report</u>
BRIEF TITLE
<u>Joseph G Hamilton, M.D.</u>
Author or Authors
<u>MAY 23 1945</u>
Date

IN GENERAL, A CLASSIFIED DOCUMENT MUST NOT BE COPIED OR DUPLICATED. IF additional copies are necessary they should be requested from the originator. In an emergency, the originator may give telegraphic approval for reproductions, specifying series letter and number of copies. The originator must be notified immediately of the distribution of the reproduced copies. All duplicating sheets, stencils, etc., should be burned. All material MUST BE KEPT IN A GUARDED AREA, IN A LOCKED SAFE OR A LOCKED FILING CABINET WITH A TUMBLER LOCK.

	READ BY	DATE
REPOSITORY	<u>NASA-Wash DC</u>	
COLLECTION	<u>ANL & Univ of Chi - Met Lab</u>	
BOX No.	<u>6(21-2) NN3-77-85-1</u>	
FOLDER	<u>Nov-May 1945</u>	

1099783

This document contains information affecting the national defense of the U. S. within the meaning of the Espionage Act, 50 U.S.C. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

October 28, 1944

100V-407230