410057

October 20, 1976

James L. Liverman, AES
THRU: H. Hollister, DAES

CONSIDERATION OF THE APPROPRIATE ROLE OF THE TTG

Staff from BER, along with Hat Barr and Joe Maher of TO, have met and discussed at length the TTG from the standpoint of its history, productivity, and future role. Several conclusions came from these discussions. It appears that the major problems have been in the area of communication. In retrospect, the Committee has probably not received appropriate feedback from AES on tasks it has undertaken and completed. This has led to the feeling on their part that their efforts may have been ineffectual. The second weakness in communication has been within the AES structure in assuring that the recommendations of the TTG reach all appropriate staff. Staff believes that these two problems can be remedied and has the following recommendations:

1. The TTG should continue.

2. It should remain advisory to the entire AES program.

3. Copies of reports from the Committee should be sent to the Directors of AES Divisions and Offices, as well as to the Assistant Administrator, unless otherwise directed by the Assistant Administrator.

4. The Directors of AES Divisions and Offices bring the report to the attention of appropriate staff.

5. The principal point of contact for the TTG be in TO.

6. All communications from the TTG should receive appropriate staff response and comment, and that this information should be made available to the TTG.

7. The TTG continue to be called on for review of segments of the Transuranics Program, as needed, for policy guidance and for other specific tasks.

8. Meetings of the TTG should be at the call of the Chairman and as required by the Assistant Administrator.

9. Membership on the TTG should be adjusted to provide for any changing membership in a manner that would maintain continuity of the group. Additions to the Committee in particular areas should be suggested by the staff.

Dr. Barr and I would be pleased to discuss these suggestions further if you wish. If you agree with these recommendations, we will arrange for a discussion with Bill Bair.

W. W. Burr, Jr., M. D.
Deputy Director
Division of Biomedical and
Environmental Research

APPROVE _____

DISAPPROVE _____

DISCUSS _____

bcc: J. Maher, TO
N. Barr, TO

DEP.DIR.

WWBurr,Jr:lmb
10/20/76

MARSHALL ISLAND SAMPLES
from Spring 1976 BNL Survey
recv'd at HASL 9/2/76 in oven-dried, homogenized state
for INTERCOMPARISON with BNL

Cs-137 DATA

HASL #	Type Sample	Island	Dry Wt. given by BNL (g)	pCi ^{137}Cs per gram
X2405	pig skin	Bikini	230	128 ± 6
X2406	" meat	"	240	224 ± 9
X2407	" bone	"	282	69 ± 3
X2408	" nose, tongue, etc.	"	18	173 ± 9
X2409	" brains & eyes	"	13	141 ± 7
X2410	" head muscles	"	35	154 ± 8
X2411	coconut crab shell	Wotje	315	0.8 ± 0.2
X2412	" " meat	"	57	1.5 ± 0.1
X2413	" " viscera	"	102	0.7 ± 0.1
X2414	" " shell	Kabelle	415	18. ± 1
X2415	" " meat	"	73	74. ± 4
X2416	" " viscera	"	119	47. ± 2
X2417	" " shell	Arbor	480	6.0 ± 0.5
X2418	" " meat	"	70	16. ± 1
X2419	" " viscera	"	68	29 ± 1

- Attachment -

NEW YORK UNIVERSITY MEDICAL CENTER
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ANTHONY J. LANZA RESEARCH LABORATORIES AT UNIVERSITY VALLEY
LONG MEADOW ROAD, STERLING FOREST, TUXEDO, N.Y.
MAIL AND TELEPHONE ADDRESS: 550 FIRST AVENUE, NEW YORK, N.Y. 10016

June 19, 1975

Dr. Robert A. Conard
Brookhaven National Laboratory
Upton, New York 11973

Dear Dr. Conard:

As I mentioned in our phone conversation this past Tuesday, (June 17), we have now completed the measurements necessary to estimate our lower limit of detection for ^{241}Am (in the skull bones) in the presence of elevated levels of ^{137}Cs. Briefly, the way in which this was calculated is as follows: we started by making the assumption that cesium and potassium have approximately the same distribution in the body; if this is true then there is approximately 6.6% of the total ^{137}Cs body burden present in the head. A further assumption was then made that the average elevated ^{137}Cs body burden is about 200 nCi which would mean a head burden of approximately 13 nCi. A "phantom" head was then fabricated to contain this amount of activity and was employed to derive the background used in the calculation of a lower limit of detection of 40 nCi ^{241}Am. Employing a safety factor of 10 and assuming that that skull contains 10% of the skeletal burden, 4000 pCi represents only 10% of one maximum permissible body burden.

As we discussed, I think that the head would be the best measurement site for determining possible internal contamination for several reasons: it represents a high bone mass with very little intervening soft tissue, ^{241}Am is a bone-seeking radionuclide, ^{137}Cs if present, will be in the brain which is not a concentrator of this nuclide and which is partially shielded by the skull bones. Furthermore, as I mentioned a body burden of 12 nCi of ^{90}Sr would not add any appreciable Bremsstrahlung background to the ^{241}Am energy region of interest. In general, then, this site would be much more applicable to measurements of the systemic burden of this nuclide than is the anterior thorax for lung counting.

background would be aboard ship, however, our familiarity with this detector system has proven to us that these thin crystal detectors are quite directional in response and, therefore, can easily be shielded by "shadowing" techniques.

We would be interested in assisting you with these measurements and are eager to take an active part in this area of your future proposed measurements. Please let me

[redacted]

know if you require additional specifics including budgetary considerations and man-time expenditures. We look forward to continued cooperation.

Very truly yours,

Norman Cohen

Norman Cohen, Ph.D.
Assistant Professor

NC/fl

cc: Dr. Stanton Cohn
Dr. Merril Eisenbud
Dr. Gerard Laurer

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IN REPLY
REFER TO: H-1-JNPL-75
MAIL STOP: 692

October 23, 1975

Dr. Robert A. Conrad
Medical Department
Brookhaven National Laboratory
Upton, NY 11973

Dear Bob:

To give you some idea of the plutonium daily excretion level of persons who are constantly exposed to plutonium, I have made a simple calculation, the results of which are attached. In this calculation, I have assumed that the person concerned acquires 4 pCi of plutonium per day. This acquistion is assumed 1) to be in a soluble form in the blood stream, and 2) to be deposited in the bone and liver, and 3) to be eliminated according to Langham's excretion equation. For a single acute uptake of D pCi in this soluble form, Langham's equation predicts a 24 hour excretion of $0.002\ D\ Z^{-0.74}$ on day Z after the uptake, i.e., $U = 0.002\ D\ Z^{-0.74}$. For continuous exposure (multiple uptakes), the excretion is predicted to be

$$U_Z = 0.002\ D \sum_{n=1}^{N} Z_n^{-0.74}$$

where D is the daily uptake in pCi
Z_n is the number of days of exposure
U_Z is the predicted excretion on day Z_n in pCi/24 hr.

The attached table is for D = 4 pCi per day and Z_n is from 1 to 60 days by daily steps and from 90 to 2190 days (6 years) in 30 day steps. For smaller daily uptakes you can divide the values of column D_Z and U_Z by the desired reduction factor.

After three years (1095 days) of exposure with the calculated uptake, the total accumulated systemic body burden would be 4330 pCi and the expected urinary excretion would be 0.163 pCi/24 hr. You stated that the sensitivity detection limit of the Health and Safety (H & S) lab runs 0.01 d/m per 24 hrs or $\sim$ 0.005 pCi/24 hr. Since the H & S has not been able to detect any activity over their limit of detection, it just could be inferred that the 3 year accumulated intake by the Bikini natives could not be in excess of $\frac{.005}{.163} \times 4330$ or $\sim$ 130 pCi or $\sim$ 0.12 nCi/day.

Assuming that a systemic plutonium body burden of 40000 pCi exposes the bone to 29 rem per year, 130 pCi would correspond to an exposure of $\sim$ 0.1 rem per year to the bone. To me, this is an insignificant exposure.

All of the above discussion is based on the assumption of uptake of soluble plutonium into the blood stream. I have difficulty in imagining how such a continuous soluble exposure could occur. Inhalation is a possible route of exposure, but the long hold up times for insoluble plutonium in the pulmonary region and lymph nodes would make detection by urine sampling difficult (to say the least) after only three years of potential exposure.

As indicated in our phone conversation our concern about plutonium exposures at LASL are at a much higher level than those expected for the Bikini natives. The urine and fecal sampling programs at LASL is given in the accompanying document, LA-3836-SOP. An early version of the computer program we use to compute systemic body burden from urine assays is described in the accompanying reprint. A later version of the computer code is currently in use, but still in development, and has not yet been documented.

The urine analysis technique at LASL does not claim the sensitivity you quoted from the Health and Safety Lab in New York. However, it has been published in Health Physics 11, 737-742 (1965) by Campbell and Moss. The following slight modification has been added to the published procedure: "Hydgroen peroxide in small quanities is added to the ash solution before the ion exchange steps to ensure formation of tetravalent plutonium, elution is accomplished with 0.36 M HCl - 0.01 M HF."

We also discussed correcting low volume urine samples to true 24 hr excretion. I indicated that I had reservations about applying such corrections for natives of on Bikini atoll, and I still entertain such reservations. However, in answer to your inquiries on ways to correct, Group H-5 has developed the following techniques for use here at LASL, using data collected under controlled conditions: Corrections are made by estimating the "elapsed time" (minutes) represented by the sample analyzed, and multiplying the amount of plutonium determined in the urine by $\frac{\text{"elapsed time"}}{1440}$.

Creatinine method:

Elapsed time (min) = 73 + 0.69 X (mg creatinine in sample)

Specific Gravity-Volume method

Elapsed time (min) = 21220 X (spec. gravity - 1) + Volume (cm^3) of sample - 415.

Here, at LASL we employ the specific gravity-volume correction, primarily because of the added work load and cost of creatinine determinations.

If I can be of further service, please let me know.

Sincerely,

James N. P. Lawrence

JNPL:cr

Encls. a/s (3)

Xc: ISD-5 (2)
File w/encl.

4. Place a glass stirring rod in the beaker to prevent bumping and cover.

5. Place the sample on a medium temperature hot plate and wet ash the urine sample. When the volume in the beaker is low enough to accommodate more sample, add an additional liter of urine and 300 ml of HNO_3. Repeat until the entire sample has been wet ashed.

6. At the last stage of wet ashing, salting out occurs. Dissolve the salts by adding 30% H_2O_2 (30 ml-100 ml) and HCl (100-300 ml) and heating carefully on a low temperature hot plate.

7. Wash down the sides of the beaker and the cover glass with deionized water. Heat the solution to boiling and boil for 10 minutes. Cool to room temperature. Add 100 mg of iron carrier solution.

[redacted]

[redacted] with NH_4OH and adjust to pH 8. Filter by gravity using double vented conical funnels (e.g. Fisher #10-381) onto a 24 cm #541 Whatman paper. Wash the precipitate with 5:100 NH_4OH solution. Discard the filtrate.

9. Return the paper and precipitate to the orginal beaker. Add HNO_3 to just cover the paper and precipitate.

10. Cover the beaker and heat on a medium temperature hot plate until the filter is decomposed. Evaporate to about 100 ml.

11. Immediately add an equivalent volume of deionized water and filter by gravity over an 18.5 cm #42 Whatman paper. Wash the precipitate with 1:1 HNO_3. Collect the filtrate in a 1 liter beaker and reserve for plutonium determination.

12. Transfer the paper to a 100 ml platinum dish. Dry at 110°C and ignite at 600°C to oxidize all carbonceous materials.

13. Cool the dish. Add 25 ml of HNO_3 and 10 ml of HF to the residue and evaporate to dryness.

14. Repeat the addition and evaporation

15. Add 25 ml of HNO_3 and 5 ml of $HClO_4$. Evaporate to dryness. Dissolve the residue in 1:1 HNO_3 and combine with the main solution reserved for plutonium determination.

16. Evaporate the solution to about 100 ml. Cool to room temperature, transfer to a 250 ml graduated cylinder and record the volume. Reserve the beaker.

17. Dispense two 100 microliter aliquots to two 150 ml beakers containing 25 ml of deionized water. Add 2-3 drops of 0.5% phenolphthalein. Titrate the two aliquots with standardized 0.1N to a phenolphthalein end point. Calculate the acid normality of the sample solution.

18. Transfer the sample from the graduated cylinder to original beaker reserved in step 16. Wash the graduated cylinder with the amount of water necessary to adjust the normality of the sample solution to 8N HNO_3.

19. Continue the analysis from ION EXCHANGE SEPARATION, in Procedure E-Pu-07.

~ 80% recovery of ^{236}Pu

Pu Analyses of Large Volume Urine Samples

Source	Collection Period	Description	Volume Analyzed (liter)	fCi Pu liter
Dikbi	Oct. 1975 BNL Survey	Split pool of 17 specimens	4.7	11 ± 2
"	Spring 1976 BNL Survey	Composite of 24 specimens	4.7	12 ± 2
Bongolap	" " " "	" " 17 "	5.3	9 ± 2
"	" " " "	24 hr. specimen*	1.2	14 ± 7
HASL	Fall 1975	Pool	20	0.9 ± 0.4
"	May-June 1976	"	20	1.1 ± 0.4
"	" " "	"	20	0.9 ± 0.4
"	Aug. 15-30, 1976	Ind. Total Collection(age 37)	20.5	0.1 ± 0.1
	"	1st child of above " (age 9)	8.6	0.05± 0.05
	"	2nd child " " " (age 6-1/2)	8.9	0.1 ± 0.1

* Peace Corps Volunteer

REPOSITORY PNNL

COLLECTION Marshall Islands

BOX No. 5684

FOLDER From Folder of Transmittal Memo
Technical Memo

DOCUMENT **DOES NOT** CONTAIN ECI

Reviewed by K Schwartz Date 4/30/97

[redacted]

BOX No. 5684

FOLDER From Files of Transcaronia Technical Group

William L. Robison

DOCUMENT DOES NOT CONTAIN ECI

Reviewed by R.E. Schuelke Date 4/30/97