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April 18, 1977

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

Dear Bob:

I apologize for the delay in mailing out the external whole body counting results on Drs. However, as I mentioned, we are still awaiting the results of the bioassay measurements of concentrations of plutonium and americium in their urines. At any rate, since it's been some time since their visit to our lab, I'll report on the in vivo measurements in this letter and send you the results of the bioassay when they become available.

Drs. arrived at the Institute of Environmental Medicine on 11 March 1977 to undergo whole body and thorax counting procedures for isotopes of plutonium and/or americium. General occupational histories for each individual were recorded, and measurements of some of the more important anthropomorphic parameters are given in Table 1. Three independent counting procedures were employed for each subject. The initial measurement for all persons who are counted in this laboratory consists of a modified meterarc geometry with the subject sitting in a standardized stainless steel chair. An 8"x4" NaI(Tl) crystal detector is employed to quantitate the presence of photons of energy greater than 100 keV including normal activities from K-40 that is present in the body. Both subjects were thus counted for a total of 30 minutes each in this geometry. Results of these measurements are then utilized along with other information for selection of a series of control subjects who have no history of possible radionuclide contamination. Figures 1 and 2 give the gamma-ray pulse height for Drs. respectively and illustrate what was determined quantitatively, i.e., that

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no abnormal concentrations of high energy emitting radionuclides are present in the body of either individual. The K-40 photopeak is prominent for each Figure.

The detection of low energy photon-emitting radionuclides in vivo is determined using two or three thin (15 cm. diam.) dual-crystal scintillation detectors (NaI-CsI(Tl) positioned about the head or over the thorax of the subject in a manner so as to achieve a maximum counting sensitivity. The measurement of low energy photons from the head are representative of radionuclides which are deposited in the skeleton. Counting over the thorax is indicative of radionuclide deposition in the lung as well as soluble radionuclides which have migrated to the skeleton and are present on thoracic skeletal surfaces. Our head counting geometry has been described in detail in various publications and the thorax counting geometry is standard in many laboratories across the country. Figures 3 and 4 give the results of individual one hour in vivo counting sessions in the head-geometry for Drs. respectively. By comparison of the quantitative counting data in the plutonium and americium energy regions with our control subject population, it has been determined that if either individual has any skull contamination by these nuclides, it is less than or equal to .02 nCi of Am-241 or~5.0 nCi Pu-239, the detection limits of our counting system for this geometry.

The detection of plutonium or americium in the lung is accomplished in the third in vivo counting procedure by positioning two detectors over the chest. Contribution to the total thorax count from activity deposited on rib cage structures is calculated from information of the skeletal concentration as measured from the head counting geometry. Thus, the actual amount of activity contained in the skeleton and lung from internally deposited radionuclides can be calculated from the measurement of the head (skull) and thorax (lung) using several of these dual crystal detectors. Figures 5 and 6 are the gross spectra resulting from 30 minute counts with two detectors positioned above the thorax of Drs. respectively. Again, no activity attributable to plutonium or americium nuclides above our limit of detection (i.e. 0.15 nCi Am-241; 25 nCi Pu-239) was noted.

As I indicated, we have collected 24-hour urine samples from each subject in addition to a partial day's sample collected during their visit to the Institute for whole body counting. These urine samples will be prepared according to our standard bioassay radiochemical procedures which require ion exchange separation of the transuranics from the sample followed by alpha spectrometry using low level SiLi surface-barrier detection systems. As soon as this information is available, I will

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send you the results.

I haven't included any of the exposure information in this letter since you have essentially all that we know in the letter that Dr. sent to you on January 21, 1977. The only additional data that was not mentioned in his letter was that Dr. worked with P-32, C-14, S-35 and Cr-51 during the years 1970-1974 at the University of Hawaii and at UCLA. He has no medical history of radiation exposure, has never smoked, is married and has no children. Dr. never worked with radioactivity, has no medical history of radiation exposure, has never smoked, is married and has two children.

I hope this report is helpful to you. Since in particular, seemed rather apprehensive about the possibility of contamination, I would suggest that as fellow scientists both individuals be informed of these results. If there is any other information that I have forgotten to mention, please don't hesitate to call.

Very truly yours,

Norman Cohen, Ph.D.
Assistant Professor of
Environmental Medicine

NC/j

Enclosures

cc; Henry Spitz

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Table I

Anthropomorphic Data

Item		
Date of Birth	8/ 7/46	6/ 6/44
Age	30	32
Sex	Male	Male
Height	173 cm	177 cm
Weight	163 lb.	151.5 lb.
Chest Measurements		
Circumference (normal)	93 cm	89.5 cm
Circumference (inhale)	96 cm	87 cm
Circumference (exhale)	92.5 cm	89.9 cm
Width (A.P.)	21.8 cm	20 cm
Width (N.N.)	31 cm	28.3 cm
Shoulder line	42 cm	46 cm
Sternum - Naval	42 cm	40 cm
Head Measurements		
Circumference (brow)	59 cm	57.5 cm
Circumference (chin)	62 cm	65.5 cm
Width (A.P.)	20.1 cm	15.8 cm
Width (ears)	15.2 cm	19 cm
Neck	37 cm	33.5 cm
Waist	87.5 cm	81 cm

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Table II

Results of In Vivo Counting

			Control Individuals	Control Individuals
	cpm	cpm	cpm	cpm
Head Geometry				
^{40}K	260.5±1.6	252.8±1.6	264.2±1.6	261.5±2.1
^{241}Am	71.0±0.8	66.7±0.8	74.9±0.9	76.0±1.1
^{239}Pu	27.7±0.5	24.9±0.5	30.3±0.6	27.6±0.7
Chest Geometry				
^{40}K	260.9±3.0	250.6±3.0	255.7±4.1	-
^{241}Am	99.2±1.8	86.1±1.7	98.1±3.0	-
^{239}Pu	26.6±0.9	26.9±1.0	27.3±1.3	-

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