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PLUTONIUM IN AUTOPSY TISSUE SAMPLES*

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PLUTONIUM IN AUTOPSY TISSUE SAMPLES

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ABSTRACT

Tissue samples have been obtained at autopsy from former plutonium workers, other employees and residents in the environs of the Hanford Atomic Project since 1949. These samples, which included lung, liver, bone, sometimes tracheobronchial lymph nodes, and occasionally other tissue samples, were analyzed radiochemically for plutonium. Data obtained since 1965 and a recapitulation of results since 1949 are presented. A discussion of these results relative to plutonium work exposure and plutonium from worldwide fallout is also presented.

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PLUTONIUM IN AUTOPSY TISSUE SAMPLES

Introduction

A program of collection and radioanalysis of tissue samples obtained postmortem from plant workers and residents in the plant environs has been maintained at Hanford since 1949. The significance of this effort lies primarily in developing the capability for assessing the overall long-term effectiveness of operating controls, safety procedures and engineering safeguards incorporated into plutonium facilities which control the release of radioactive materials to the Hanford environs. The data obtained in this program can also be important for assessing the overall impact of occupational exposure on workers and evaluating the applicability of internal deposition prediction models through correlation of exposure conditions and resulting body burdens. In addition such data may permit assessment of possible causative association of radioactive materials *in situ* and observed pathological conditions in cases involving large amounts of radioactive material.

Results obtained in this program through early 1965 were summarized by Newton, et al. (1967). It is the purpose of this paper to update those program results for selected tissue samples from the approximately 350 cases obtained since program inception.

Program Description

At present, tissue samples obtained consist of portions of lung, liver, bone and the tracheobronchial lymph nodes from

non-contageous disease autopsy cases as selected by the pathologist. In addition, blood, pancreas, prostate, seminal vesicles and occasionally spleen samples have been taken. Because of the infrequency of measurable plutonium in these samples, they are no longer obtained on a routine basis. In cases where significantly measurable plutonium was anticipated because of known occupational exposure, the sampling of tissues has been more extensive.

Sample sizes have varied over the years, but large samples are now sought in an effort to improve the sensitivity of the measurement and to improve confidence in estimates of whole organ content where non-uniform distributions of plutonium within the organ may exist. When practical, the left lung and approximately 200 grams of liver and 100 grams of bone are taken for radioanalysis. Bone samples usually consist of sternum although rib and vertebra have been sampled also. All prominent tracheobronchial lymph nodes in the vicinity of the carina are sampled routinely.

Samples are dry ashed and then brought into solution with nitric acid. Because of problems associated with relatively large amounts of mineral salts, bone samples are usually taken into solution and a portion is passed through an ion exchange column and finally through the remainder of the process. Other tissue samples are processed in total. The plutonium is isolated by lanthanum fluoride coprecipitation, TTA (thenoyltrifluoroacetone) extraction and prepared for counting by electrodeposition on

stainless steel disks. The final preparation may be counted electronically for alpha particles if sufficient plutonium is present or analyzed by autoradiography and alpha track counting after the method of Schwendiman, Healy and Reid (1951) for increased measurement sensitivity. Although reporting is usually given in terms of plutonium-239, the process yields total plutonium alpha.

Detection capabilities for plutonium in tissue samples have varied over the years and have been particularly sensitive to the alpha tracks in the film emulsion due to background sources. Prior to 1954, the detectable amount of plutonium was nominally taken to be 0.3 disintegrations per minute (d/m) or about 0.1 picocuries pCi = 10^{-2}Ci). From 1954 to 1958 a detection limit of 0.05 d/m per sample was used. During the period 1958 through 1964, 0.025 d/m per sample was considered detectable. Since that time a nominal minimum reporting limit of 0.05 d/m per sample has been adopted.

Results and Discussion

Analytical results for samples obtained through late 1970 are appended in detail for lung, liver, bone and tracheobronchial lymph nodes. Cases are segregated according to whether the individual had a history of employment in Hanford plutonium facilities, other Hanford employment, was a local resident for more than three years, or was a local resident for less than three years or was a non-resident. Those having had a history of employment in Hanford

plutonium facilities are elsewhere in this paper, also referred to as Plutonium Workers. In reality this group includes those having a significant potential for exposure to plutonium such as process operators, maintenance personnel and radiation monitors, and in addition includes patrolmen, engineers, office workers and others engaged in non-plutonium work who nevertheless had access to the plutonium facilities and could have been exposed to plutonium aerosols.

Detailed work histories including incidents of known exposure to plutonium and results of bioassay sampling are available for many of the plutonium workers. As older and sometimes vague work histories continue to be investigated, it is possible that a few individuals may be reclassified. It may also be necessary to reclassify some non-occupationally exposed individuals if investigation reveals early Hanford employment. Computerized record keeping in recent years has greatly simplified the search for evidence of Hanford employment. Investigation for possible employment prior to that time is laborious.

Since only portions of organs were sampled and in most cases the entire organ was not weighed, it was considered more appropriate to report the results of the radioanalysis in terms of concentrations of plutonium in tissues, i.e., femto Curies (fCi = 10^{-15}Ci) ^{239}Pu/gram, than in terms of activity per sample. Sample weights were

obtained by weighing the frozen specimens after thawing. Although imprecise due to differences in organ weights among individuals and other factors, the use of standard man organ weights and the reported concentrations permit some indication of plausible total organ burdens.

The appended data reveal a large number of small positive results, a larger number of values reportable only as less than some variable amount and a few larger measured values. While a large number of small or not significantly measurable results support a conclusion of adequate controls on releases of plutonium, they are cumbersome to summarize and present adequately. Further, division of the analytical results by highly variable sample weights results in reported values with apparently grossly different detection limits. In order to simplify the presentation of data, certain cases have been selected for tabulation in the body of this report. Such cases were included if the sample weight had been measured and if one of the tissue sample analyses was greater than an arbitrarily selected 5fCi Pu/gra Analytical results fitting those criteria for data reduction are presented in Tables I and II. There, cases have been categorized as to Plutonium Workers, Other Hanford Workers, Local Residents and Non-Residents. No activity entry indicates that no sample was taken. It may be noted that a sustained concentration of 5fCi Pu/gram in soft tissue will result in a calculated dose of about 5 mrem/year to that tissue and the same concentration of Pu in bone will result in a calculated dose of about 25 mrem/year to bone.

Table I

CONCENTRATIONS OF PLUTONIUM IN TISSUE SAMPLES

Case No.	Years Potential Pu Exposure	Sex	Age At Death	Cause of Death or Major Disease	Activity fCi/g: Tracheo-bronchial Lymph Nodes	Lung	Liver	Bone
Hanford Plutonium Workers (71)								
1450	4	M	50	Tuberculosis, pericarditis		<6	5.9	
0256	7.5	M	63	Pulmonary Emphysema		11	34	<2
4858	13	M	56	Coronary heart disease		9.2	7.6	<2
2661	0.5	M	54	Coronary heart disease	9.0	0.78	4.8	<4
3162	10	M	54	Skin burns	60	34	8.3	<2
5362	6	M	51	Coronary heart disease	7.8	25	8.0	<3
1963	4	M	62	Pulmonary emphysema	<3	0.6	7.9	<2
H100	25	M	55	Coronary heart disease	23,000	170	42	220
Others Having Had Hanford Work Experience (89)								
0158		M	52	Carcinoma of prostate		9.1	24	4.4
2459		M	65	Postoperative - prostatectomy	<2	0.91	5.0	<3
3660		M	62	Amyotrophic lateral schlerosis	<4	0.84	<0.4	6.1
4963		M	71	Acute myocarditis	7.4	0.33	0.48	<1
2164		F	57	Coronary heart disease	5.9	0.84	0.28	14
2264		M	63	Cerebral thrombosis	30	0.17	2.4	<2
2665		M	62	Ruptured aortic aneurysm	4.1	1.1	0.46	125
1269		M	56	Coronary heart disease	9.5	<0.05	0.34	<7

Table II

CONCENTRATIONS OF PLUTONIUM IN TISSUE SAMPLES

Case No.	Sex	Age At Death	Cause of Death or Major Disease	Activity fCi/g: Tracheo-bronchial Lymph Nodes	Lung	Liver	Bone
Local Residents of More Than Three Years (146)							
0258	M	66	Coronary heart disease		<0.2	0.54	7.7
1959	F	12	Drowning	13	<0.3	0.77	<4
3461	M	40	Cerebral hemorrhage	5.4	0.63	<0.7	<3
2165	F	67	Bronchogenic carcinoma	140*	<0.2	0.68	<9
3967	F	61	Pulmonary emphysema		<0.05	1.0	5.2
4167	F	53	Mitral stenosis		<0.04	0.18	5.7
4367	M	49	Acute liver failure		<0.04	0.20	9.3
Individuals Not Residing Locally (50)							
1050	M	34	Trauma		<4	6.5	
1657	F	59	Generalized lymphosarcoma		1.8	<0.8	5.7
0764	M	82	Chronic lymphocytic leukemia	68	<0.1	<0.4	<2
3264	F	70	Carcinoma of kidney	6.3	0.31	0.70	<0.5
3664	F	50	Carcinomatosis	6.0	0.69		
4867	F	36	Scleroderma	6.2	0.63	<0.08	<7

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*Result is questionably high due to erratic laboratory background at time of analysis and small sample size (0.2 gram). Under usual conditions the minimum reporting limit for this sample size would be 110 fCi/g.

Table I reveals that there were 16 cases out of 160 or 10 percent of the occupationally-exposed individuals having at least one tissue sample for which a concentration of 5fCi/Pu gram was measured. Of the 16 occupationally-exposed individuals, one-half had no confirmed exposure to plutonium. Further investigation into work histories for these individuals may reveal a potential for exposure to plutonium not presently known. Unrecognized laboratory contamination could possibly account for some positive results. It is not considered likely that these results are due to fallout from weapons testing since for the period of interest, expected concentrations of plutonium in lung would amount to less than 0.5 fCi Pu/gram as calculated by Newton, et al. (1967). The conspicuously large results for Case H100 will be discussed later.

As shown in Table II, there were 13 individuals out of 193 having no known occupational exposure to plutonium for whom a concentration of 5 fCi/gram or more in at least one tissue sample is reported. Again, it is possible that some of these individuals will be shown eventually to have worked in a plutonium facility at some time. The reason for the relatively frequent positive measurements of plutonium in bone, assuming that these individuals were indeed not exposed to occupational sources of plutonium is unknown. Contamination of the samples may be indicated, since the four results reported for 1967 were all processed on the same slide at the same time.

CONCENTRATIONS OF PLUTONIUM IN SELECTED

TISSUE SAMPLES FROM CASE H100

Tissue	Activity-fCi/g	Fresh Wt.-g
Carina lymph node	61,000	1.10
Intra pulmonary lymph nodes	20,000	2.2
Hilar lymph nodes, right	12,000	1.2
Other tracheobronchial lymph nodes and adjacent connective tissue	2,400	1.44
Pleura and sub-pleura left lung	520	148*
Vertebrae (lumbar)	340	103.7
Hepatic lymph node	180	2.2
Rib	99	113.3
Liver	42	259.3
Parenchyma left lung	8.8	562*

*Formalin fixed weight

Case H100 is unique in that it represents the first case for which significantly measurable amounts of plutonium were anticipated and a thorough sampling was undertaken. This case is associated with long-term experience in plutonium facilities and the individual was involved in a number of incidents involving exposure to plutonium or to the potential for exposure. In addition to a detailed work history, considerable bioassay data exist for this individual. Because of the extensive work history of this case, a much more detailed analysis will be made of exposure, bioassay results and ultimate body burden and presented elsewhere. Only a few highlights of this case will be presented here for comparison

The data for Case H100 as presented in the appendix and in Table I have been manipulated to conform to the same reporting method of the other cases. Some pertinent detailed data for this case are also presented in Table III. There the concentrations of plutonium in various tissue samples are presented in descending order of concentration. At least in terms of total plutonium per gram of tissue, the importance of the lymph nodes in an autopsy sampling program is strikingly confirmed in this case. Based on these results, plutonium occurs in relatively small amounts in the lung parenchyma. The importance of lung and liver samples, however, is substantiated in Table I where significantly measurable quantities of plutonium in these tissues occur frequently. Positive measurements found in the usual lung samples may be due to the presence of plutonium in the pulmonary lymph nodes, which are not usually removed and

analyzed separately. The occurrence of plutonium in the liver and/or bone, but without measurable plutonium in the lung or tracheobronchial lymph nodes, is suggested as due to entry via contaminated puncture wounds or lacerations.

Except for Case H100, the only case for which the bioassay program was found to yield positive results was Case 5362. As reported by Newton, et al. (1967), three positive urine analyses for plutonium were obtained for this individual (Case #28/532 in that work) which suggested a body burden of 0.4 nanocurie (nCi = 10^{-9}Ci). They also reported that, based on autopsy results, the individual's total body burden was calculated to be less than 0.06 nCi. The infrequency with which occupationally-exposed cases having a record of positive bioassay results are obtained emphasizes the importance of maximizing the number of autopsy cases sampled and the need to maintain such a program over many years.

Using standard man parameters and 0.02 d/m plutonium/10^3 Cu. ft. of air as representative of plutonium in air due to fallout, Newton, et al. (1967) calculated a lung burden of 1 d/m for continuous inhalation. An airborne concentration of 0.02 d/m 10^3 Cu. ft. is equivalent to about 350 attocuries (aCi = 10^{-18}Ci)/m^3. Fallout since 1964 has tended toward smaller values of plutonium in air and in late 1970 was on the order of 50 aCi/m^3 according to the Environmental Protection Agency (1971). As a result of this decline, no new calculation of expected lung burden was made and a much rounded concentration of 0.5 fCi Pu/g of lung is taken as attributable to fallout. Although this value is not significant in terms of the data of Table I, many of the appended results are within an order of magnitude of this value.

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The two principal routes for occupational exposure to plutonium are inhalation of plutonium aerosols and absorption of plutonium through contaminated wounds. In the former case, significantly measurable concentrations of plutonium, as suggested by the animal experiments of Park, Bair and Busch (1971), may be expected in the tracheobronchial lymph nodes and lesser concentrations in lung, liver and bone, respectively, when the aerosol consists largely of relatively insoluble plutonium dioxide particles. In the case of a predominantly plutonium nitrate aerosol, concentrations of plutonium of nearly equal amounts would be expected in lungs and tracheobronchial lymph nodes, followed by smaller concentrations in liver and bone, respectively, as suggested by results of plutonium analysis made on tissues from animals sacrificed 30 days after exposure as reported by Bair, Willard, Herring and George (1962). Results of plutonium analysis of tissues from animals sacrificed 100-300 days after exposure to a plutonium nitrate aerosol as reported by Park, Bair and Howard (1967) again suggest concentrations of of plutonium predominantly in the tracheobronchial lymph nodes and lesser concentrations in lung, liver and bone, respectively. Similarly, in case of plutonium wounds with plutonium nitrate-like material, intravenous injection of plutonium nitrate in dogs suggests that liver and spleen contain the largest concentrations of plutonium followed by tracheobronchial lymph nodes, bone and lung respectively. Because an individual may be exposed to different compounds and different modes of intake and at different times during his work experience, it is not surprising that the order of concentration of plutonium in tissue as suggested by animal experiments is followed in only a few human cases. 0012529

The number of cases appended amounts to about one-third of the total autopsies performed at Kadlec Hospital during the period 1949 to 1970. As stated, samples were taken from cases not evidencing contageous diseases and except in isolated instances, sampled cases did not include children and did not include infants or stillborns. For several years the number of individuals sampled was small and on an annual basis the fraction of autopsy cases sampled was at times much less than one-third. Because of these sampling biases, the fact that selection from autopsied cases itself introduces a statistical sampling bias and since the cause of deaths for all those dying locally since 1949 is not presently in hand, development of disease incidence rates for comparison with nationally obtained rates was considered to be an inappropriate use of these data.

A statistical analysis was, however, made of the relative incidence of lung cancer based on the 20-year sampling results for males among the four categories of individuals sampled. Results of that analysis indicated that there was no statistically significant difference in the incidence rates for lung cancer among all Hanford employees, local residents and non-residents. Comparison of the incidence rate of lung cancer for individuals in the Plutonium Worker category and individuals in the Other Hanford Employment category revealed that, statistically, the incidence rate for the Plutonium Worker category was most likely less than that of the Other Hanford Employment category. In view of the apparently complex etiology of lung cancer, and because of the small number of cases compared, the lack of

knowledge of smoking habits among individuals sampled, and other vagaries of the analysis, judgement on the significance of this result is deferred pending further collection of data and study.

Conclusions

The reported measurements of plutonium in tissue samples obtained at autopsy from former Hanford employees and residents in the plant environs continue to demonstrate that while for some workers measurable plutonium does occur in the body, the majority of workers and residents have not received significantly measurable amounts of plutonium. In no case was plutonium found in tissue samples in an amount that would suggest an annual dose to the tissue exceeding the recommendation of the National Council on Radiation Protection and Measurements (1971) of 15 rem/yr to specific organs for those occupationally exposed and 0.5 rem/yr to non-occupationally exposed individuals in the general population.

In cases of significant occupational exposure to plutonium, the results of analyses at autopsy dramatically identify preferential sites of plutonium retention in the body and provide a basis for evaluating the precision of bioassay and *in vivo* counting as tools for estimating amounts of plutonium internally deposited.

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Appendix - Table I

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

HANFORD PLUTONIUM WORKERS

Case No	Years Potential Pu Exposure	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Trache bronch Lymph N fCi/gram	Trache bronch Lymph N g
0049	2	M	40	Calculus in common bile duct, acute Peritonitis	<10	13	<10	15	<20	7	No Sam	
1450	4	M	50	Tuberculosis, Pericarditis	<6	25	5.9	37	N.S.		N.S	
0151	4	F	52	Carcinoma of Colon	<4	34	<3	45	N.S.		N.S	
0252	2	M	44	Carcinora of Kidney	<5	30*	<5	30*	<20	8*	N.S	
2852	4	M	61	Coronary Heart Disease	<5	30*	<5	30*	<20	8*	N.S	
3352	1	M	53	Peritonitis	<5	30*	5	30*	<20	8*	N.S.	
0553	3.5	M	46	Carcinoma of Rectum	<5	30*	<5	30*	N.S.		N.S.	
0953	4.5	M	61	Pulmonary Emphysema	<5	30*	<5	30*	<20	8*	N.S.	
2053	5	M	62	Carcinoma of Kidney	<5	30*	<5	30*	<20	8*	N.S.	
2553	1.5	M	55	Coronary Heart Disease	44	30*	56	30*	<20	8*	N.S	
2753	1.5	M	58	Malignant Melanoma	<5	30*	<5	30*	<20	8*	N.S	
3154	5	M	44	Ruptured Aorta	<0.9	26	3.1	29	<3	8	N.S	
1255	15	M	41	Carcinoma of Colon	0.78	40	4.3	33	<3	8*	N.S	
1855	1.5	M	41	Blast Injuries	<0.3	72	<0.9	24	<3	9	N.S	
2555	4.5	M	56	Polyserositis	<0.7	33	<1	22	<3	8	N.S	
0256	7.5	M	63	Pulmonary Emphysema	11	48	34	28	<2	12	N.S	
1456	8	M	65	Bronchogenic Carcinoma	<0.7	31	<0.9	26	<3	8	N.S	

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Appendix - Table I

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

HANFORD PLUTONIUM WORKERS

Case No	Years Potential Pu Exposure	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
3156	9	M	37	Subarachnoid Hemorrhage	0.6	51	4.3	27	<4	6	N.S.	
1157	11.5	M	61	Rheumatic Heart Disease	<0.7	34	1.0	24	<3	6	N.S.	
1058	8	M	69	Carcinoma of Rectum	<0.5	23	<0.4	26	<2	6	N.S.	
1158	2	M	46	Hodgkin's Disease	0.62	43	1.2	26.9	N.S.		N.S.	
1358	2	F	32	Cerebral Hemorrhage	<0.3	33	<0.3	33	<2	5	N.S.	
2158	12	M	49	Laennec Cirrhosis of Liver	<0.3	35	0.55	26	3.7	12	N.S.	
4258	8	M	47	Laennec Cirrhosis of Liver	<0.4	30	<0.5	23	<2	6	N.S.	
4858	13	M	56	Coronary Heart Disease	9.2	54	7.6	26.9	<2	6	N.S.	
0660	16	M	51	Hodgkins Disease	0.83	110	0.93	114	<1	12	N.S.	
1760	1	M	63	Subdural Hemmorrhage	<0.5	20	<0.3	38	<3	4	<60	0.2
2460	14.5	M	59	Bronchogenic Carcinoma	<0.3	41	2.0	20	<2	6	<20	0.6
4060	15	M	41	Coronary Heart Disease	<0.4	27	1.4	26	<2	5	<10	0.8
0861	4	M	40	Fibrosarcoma	0.43	39	<0.4	26	<1	8	<9	1.2
2661	0.5	M	54	Coronary Heart Disease	0.78	39	4.8	22	<4	3	9.0	1.4
3561	7	F	68	Laennec Cirrhosis of Liver	<0.4	26	<0.6	19	<3	4	<8	1.4
5261	10	M	53	Cerebellar Hemorrhage	<0.2	49	0.53	27	<3	4	<2	7
0462	11	M	67	Generalized Lymphosarcoma	<0.7	17	0.50	33	<2	7.5	<6	2.0

Appendix - Table I

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

HANFORD PLUTONIUM WORKERS

Case No	Years Potential Pu Exposure	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
2362	5	M	65	Coronary Heart Disease	<0.3	40	<0.4	29	<3	4	<2	7
3162	10	M	54	Skin Burns	34	47	8.3	26	<2	5	60	5
3562	14	M	56	Carcinoma of Rectum	<0.3	40	<0.7	16	<2	5	<4	3
3962	1.5	M	50	Bronchogenic Carcinoma	<0.2	55	<0.6	20	<2	5	<3	4
4562	9	M	55	Hodgkins Disease	1.6	28	<0.7	16	<2	6	<3	4
4962	14	M	60	Acute Purulent Meningitis & Carcinoma of Rectum	0.38	34	<0.5	23	<2	7	<6	2
5362	6	M	51	Coronary Heart Disease	25	32	8.0	28	<3	4	7.8	3.5
1263	9	M	61	Bronchogenic Carcinoma	<0.2	55	<0.2	51	<1	10	<1	12
1763	3	M	60	Coronary Heart Disease	0.41	49	0.78	24	<2	6	<2	5.6
1963	4	M	62	Pulmonary Emphysema Post-operative-Prostatectomy	0.60	46	7.9	30	<2	5	<3	4
2063	1	M	59	Cerebral Hemorrhage	0.32	43	<0.4	32	<2	5	6.3	[illegible]
2663	3.5	M	71	Bronchogenic Carcinoma	1.0	67	2.7	28	<2	6	<3	3.9
2963	7	M	51	Coronary Heart Disease	0.44	70	<0.2	56	<3	4	<1	12.8
3063	3	M	50	Coronary Heart Disease	0.44	68	<0.4	28	<3	4.2	<2	5.6
3363	1	M	61	Carcinoma of Trachea	0.88	44	<0.2	45	<1	11.8	<9	1.3
3563	9	M	63	Carcinoma of Colon	0.95	33	<0.5	24	<3	4	<3	3.5
3663	4	M	54	Coronary Heart Disease	0.31	67	<0.1	94	<2	6	<3	3.6
[illegible]	[illegible]	M	70	Cancer of [illegible]								

0012536

Case No	Years Potential Pu Exposure	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
2362	5	M	65	Coronary Heart Disease	<0.3	40	<0.4	29	<3	4	<2	7
3162	1[illegible]	M	54	Skin Burns	34	47	8.3	26	<2	5	60	5
3562	14	M	56	Carcinoma of Rectum	<0.3	40	<0.7	16	<2	5	<4	3
3962	1.5	M	50	Bronchogenic Carcinoma	<0.2	55	<0.6	20	<2	5	<3	4
4562	9	M	55	Hodgkins Disease	1.6	28	<0.7	16	<2	6	<3	4
4962	14	M	60	Acute Purulent Meningitis & Carcinoma of Rectum	0.38	34	<0.5	23	<2	7	<6	2
5362	6	M	51	Coronary Heart Disease	25	32	8.0	28	<3	4	7.8	3.5
1263	9	M	61	Bronchogenic Carcinoma	<0.2	55	<0.2	51	<1	10	<1	12
1763	3	M	60	Coronary Heart Disease	0.41	49	0.78	24	<2	6	<2	5.6
1963	4	M	62	Pulmonary Emphysema Post-operative-Prostatectomy	0.60	46	7.9	30	<2	5	<3	4
2063	1	M	59	Cerebral Hemorrhage	0.32	43	<0.4	32	<2	5	6.3	[illegible]
2663	3.5	M	71	Bronchogenic Carcinoma	1.0	67	2.7	28	<2	6	<3	3.9
2963	7	M	51	Coronary Heart Disease	0.44	70	<0.2	56	<3	4	<1	12.8
3063	3	M	50	Coronary Heart Disease	0.44	68	<0.4	28	<3	4.2	<2	5.6
3363	1	M	61	Carcinoma of Trachea	0.88	44	<0.2	45	<1	11.8	<9	1.3
3563	9	M	63	Carcinoma of Colon	0.95	33	<0.5	24	<3	4	<3	3.5
3663	4	M	54	Coronary Heart Disease	0.31	67	<0.1	94	<2	6	<3	3.6
4563	3	M	70	Cancer of Head of Pancreas	0.16	161	0.36	98	<1	15	<1	8
4863	4	M	50	Pulmonary Embolism	0.17	140	0.19	106	<0.9	12	<10	1

Appendix - Table I

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

HANFORD PLUTONIUM WORKERS

Case No	Years Potential Pu Exposure	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
5563	3	M	61	Carcinoma of Stomach	0.43	90	0.45	35	<1	8	<3	4
0164	8	M	72	Ruptured Aortic Aneurysm	0.34	280	0.24	277	<2	7	<2	7
1264	11	M	54	Coronary Heart Disease	0.40	67	N.S.		0.39	35	<4	3
1564	3	M	65	Emphysema	0.20	271	3.4	120	<0.5	23	1	8
2764	5	M	53	Coronary Heart Disease	0.24	166	N.S.		0.39	35	2.7	5
3064	1	M	55	Carcinoma of Lung	0.73	148	0.31	87	<1	12	N.S.	
4764	8	M	72	Metastatic Hypernephroma	0.82	41	2.4	112	<0.7	17	<2	5
5264	9	M	62	Coronary Heart Disease	0.26	242	1.0	100	<0.4	29	<3	4
0465	15	F	51	Carcinoma of Ileum	0.35	169	0.30	75	<2	11	<4	6
1965	10	M	67	Bronchogenic Carcinoma	1.4	93	0.22	121	3.4	6.6	<25	0.9
0366	18	M	66	Cerebral Thrombosis	<0.1	191	0.23	125	<9	2.5	<2	9.2
1266	3	M	68	Coronary Heart Disease	0.20	175	0.50	64	<1	18	<20	1.2
1867	19	M	44	Coronary Heart Disease	0.049	696	1.2	212	2.6	262	N.S.	
4767	8	M	57	Mitral Insufficiency	<0.03	851	<0.1	272	<3	212	N.S.	
2469	18	M	68	Aortic-iliac Bypass	<0.1	220	<0.09	250	<3	170	<4	6.3
3569	20	M	53	Coronary Heart Disease	<0.06	400	<0.1	200	<3	180	N.S.	

HANFORD PLUTONIUM WORKERS

Case No	Years Potential Pu Exposure	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheobronchial Lymph Nodes fCi/gram	Tracheobronchial Lymph Nodes Wt gram
5563	3	M	61	Carcinoma of Stomach	0.43	90	0.45	35	<1	8	<3	4
0164	8	M	72	Ruptured Aortic Aneurysm	0.34	280	0.24	277	<2	7	<2	7
1264	11	M	54	Coronary Heart Disease	0.40	67	N.S.		0.39	35	<4	3
1564	3	M	65	Emphysema	0.20	271	3.4	120	<0.5	23	1	8
2764	5	M	53	Coronary Heart Disease	0.24	166	N.S.		0.39	35	2.7	5
3064	1	M	55	Carcinoma of Lung	0.73	148	0.31	87	<1	12	N.S.	
4764	8	M	72	Metastatic Hypernephroma	0.82	41	2.4	112	<0.7	17	<2	5
5264	9	M	62	Coronary Heart Disease	0.26	242	1.0	100	<0.4	29	<3	4
0465	15	F	51	Carcinoma of Ileum	0.35	169	0.30	75	<2	11	<4	6
1965	10	M	67	Bronchogenic Carcinoma	1.4	93	0.22	121	3.4	6.6	<25	0.9
0366	18	M	66	Cerebral Thrombosis	<0.1	191	0.23	125	<9	2.5	<2	9.2
1266	3	M	68	Coronary Heart Disease	0.20	175	0.50	64	<1	18	<20	1.2
1867	19	M	44	Coronary Heart Disease	0.049	696	1.2	212	2.6	262	N.S.	
4767	8	M	57	Mitral Insufficiency	<0.03	851	<0.1	272	<3	212	N.S.	
2469	18	M	68	Aortic-iliac Bypass	<0.1	220	<0.09	250	<3	170	<4	6.3
3569	20	M	53	Coronary Heart Disease	<0.06	400	<0.1	200	<3	180	N.S.	
0470	9	M	69	Coronary Heart Disease	<0.1	230	<0.1	210	<2	220	<6	4
H100	25	M	55	Coronary Heart Disease	170	729	42	259	220	104	23,000	3.8

*Sample weights estimated.

Appendix - Table 2

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

OTHERS HAVING HAD HANFORD WORK EXPERIENCE+

Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
M	57	Trauma	<5	30*	<5	30*	<20	8*	N.S.	
M	54	Coronary Heart Disease	<5	30*	<5	30*	<20	8*	N.S.	
M	46	Trauma	<5	32	<3	44	<9	16	N.S.	
M	49	Subacute Bacterial Endocarditis	<4	36	<4	34	<8	18	N.S.	
M	57	Massive Pulmonary Embolism	<7	22	<4	38	<10	14	N.S.	
M	46	Coronary Heart Disease	<5	30*	<5	30*	<20	8*	N.S.	
M	45	Trauma	<5	30*	<5	30*	<20	8*	N.S.	
M	58	Bronchogenic Carcinoma	<5	30*	<5	30*	<20	8*	N.S.	
M	51	Bronchogenic Carcinoma	<5	30*	<5	30*	<20	8*	N.S.	
M	62	Coronary Heart Disease	<5	30*	<5	30*	<20	8*	N.S.	
M	57	Carcinoma of Esophagus	<5	30*	<5	30*	<20	8*	N.S.	
M	61	Duodenal Ulcer	<5	30*	<5	30*	<20	8*	N.S.	
F	54	Carcinoma of Uterus	<5	30*	<5	30*	<20	8*	N.S.	
M	65	Calcific Aortic Stenosis	<5	30*	<5	30*	<20	8*	N.S.	
M	51	Coronary Heart Disease	<5	30*	<5	30*	<20	8*	N.S.	

0012540

Appendix - Table 2

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

OTHERS HAVING HAD HANFORD WORK EXPERIENCE+

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-Bronchial Lymph Nodes fCi/gram	Tracheo-Bronchial Lymph Nodes Wt gram
2954	M	56	Calcific Aortic Stenosis	N.S.		<0.6	36	<3	7	N.S.	
3354	M	70	Myocardial Infarcts	<0.4	55	<0.8	29	<3	8	N.S.	
1155	M	61	Carcinoma of Ampulla of Vater	<1	22	<1	24	<3	7.7	N.S.	
1655	M	67	Ruptured Arterial Aneurysm	<0.5	49	<0.8	27	<3	8.2	N.S.	
0756	M	37	Diabetic Glomerulosclerosis	<0.4	52	<0.7	32	<3	6.5	N.S.	
0956	M	66	Pleural Mesothelioma	0.78	38	1.6	33	<4	5.7	N.S.	
1556	M	39	Pneumotharax after Resection of Carcinoma of Thyroid	<0.5	46	<0.8	27	<3	7.8	N.S.	
2456	M	73	Hemorrhage in Cerebellum, pons and Medulla	<0.4	56	1.4	19	<4	5.3	N.S.	
2956	M	60	Bronchogenic Carcinoma	0.58	40	1.7	27	<3	7.5	N.S.	
0457	M	63	Laennec's Cirrhosis of Liver	<0.8	30	<1	17	<2	9.1	N.S.	
0557	F	40	Coronary Heart Disease	<0.5	44	<1	20	<10	2.3	N.S.	
0957	M	62	Bronchopneumonia	N.S.		<0.6	40	<4	6.1	N.S.	
1957	M	48	Bronchogenic Carcinoma	<0.6	36	<2	9.6	<2	12.6	N.S.	
2957	M	59	Carcinoma of Pancreas	<0.9	26	<0.8	30	<3	6.8	N.S.	
0158	M	52	Carcinoma of Prostate	9.1	33	24.0	34	4.4	6.0	N.S.	
0758	M	47	Coronary Heart Disease	0.46	29	0.92	37	<2	5.2	N.S.	
4758	M	61	Bronchogenic Carcinoma	0.88	37	0.73	32	<4	3.2	N.S.	

0012541

Appendix - Table 2

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

OTHERS HAVING HAD HANFORD WORK EXPERIENCE+

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-Bronchial Lymph Nodes fCi/gram	Tracheo-Bronchial Lymph Nodes Wt gram
0159	M	60	Coronary Heart Disease and Carcinoma of Bladder	<0.4	26	<0.5	21	<2	6.3	N.S.	
0559	M	62	Cerebral Hemorrhage	0.95	31	1.2	23	<2	5.5	N.S.	
0859	M	47	Cerebral Hemorrhage	0.25	53	<0.5	18	1.9	6.7	N.S.	
1159	M	46	Rheumatic Aortic Stenosis	<0.4	30	0.77	19	<1	7.9	N.S.	
1359	M	32	Malignant Brain Tumor	0.40	35	<0.8	14	<1	7.7	4	2.9
2439	M	65	Postoperative Complications following Prostatectomy	0.91	28	5.0	23	<3	4.0	<2	5.0
0860	F	50	Carcinoma of Ovaries	0.45	54	N.S.		<1	8.6	<3	4.3
1260	M	55	Bronchogenic Carcinoma	0.80	64	<0.4	30	<2	5.1	<30	0.4
2160	M	64	Carcinoma of Stomach	0.39	33	0.93	16	<3	4.1	<3	4.3
2660	M	52	Coronary Heart Disease	<0.4	31	<0.6	18	<3	4.0	<20	0.6
2760	M	69	Generalized Lymphosarcoma	<0.4	25	<0.6	19	<4	3.2	<3	4.0
3660	M	62	Amyotrophic Lateral Sclerosis	0.84	26	<0.4	25	6.1	4	<4	2.8
3860	M	50	Coronary Heart Disease	<0.2	60	<0.4	17	<1	10	<6	2.0
4460	M	61	Aplastic Anemia	<0.4	25	<0.5	22	<2	7.1	<20	0.7
0161	M	39	Rheumatic Mitral Stenosis	<0.4	30	<0.6	18	<2	4.6	<10	1.0
0961	M	58	Bronchogenic Carcinoma	<0.3	33	<0.5	22	<3	3.6	3.1	4.7

Appendix - Table 2

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

OTHERS HAVING HAD HANFORD WORK EXPERIENCE+

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
1261	M	51	Postoperative Massive Pulmonary Embolism	<0.4	25	<0.5	20	<2	4.1	<10	1.6
1461	F	61	Arteriovenous Angioma of Brain	<0.3	43	<0.4	27	<6	1.8	<30	0.4
3861	M	35	Esophageal Diverticulum	<0.3	46	<0.5	20	<2	6.0	<3	4.0
1762	M	55	Bronchogenic Carcinoma	<0.4	30*	<0.4	30*	<1	8*	<3	4*
4362	M	52	Postoperative Massive Pulmonary Embolism	<0.3	33	<0.4	29	<2	5.0	<6	2.0
4862	M	57	Bronchogenic Carcinoma and Carcinoma of Prostate	0.55	52	1.3	19	<3	4	<10	1
1663	M	63	Multiple Myeloma	0.29	45	<0.3	37	<2	5	<4	3
1863	M	60	Brochogenic Carcinoma	<0.1	78	<0.5	24	<4	3	<4	3
2263	M	82	Thrombosis of Vertebral Artery	N.S.		<0.7	17	<1	7.6	<8	1.4
2463	M	51	Bronchogenic Carcinoma	0.39	32	0.60	33	<1	9	<2	7
4063	M	65	Cerebral Hemorrhage	0.54	290	0.74	84	<2	6	<3	4
4663	M	67	Coronary Heart Disease	0.22	148	0.077	193	<1	11	<2	6

CONCENTRATION OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

OTHERS HAVING HAD HANFORD WORK EXPERIENCE+

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
4963	M	71	Acute Myocarditis	0.33	109	0.48	115	<1	115	7.4	2
0464	M	48	Esophageal Varicies and Laennec's Cirrhosis of Liver	0.81	155	1.8	229	<2	6	<3	4
1664	M	87	Endocarditis of Mitral Valve with Multiple Emboli	<3	139	1.1	62	<1	10	<1	8
2164	F	57	Coronary Heart Disease	0.84	96	0.28	48	14	5	5.9	2.3
2264	M	63	Cerebral Thrombosis	0.17	238	2.4	225	<2	7	30	3
3164	M	49	Coronary Heart Disease	0.32	170	0.34	107	<0.5	20	<4	3
4064	M	74	Coronary Heart Disease	0.68	92	1.1	179	N.S.		<2	6.5
5464	M	58	Hypertensive Heart Failure	0.48	140	0.20	180	0.48	28	<2	7.5
0865	M	76	Coronary Heart Disease	N.S.		1.0	75	N.S.		<1	18.4
1265	M	55	Coronary Heart Disease	0.21	129	<0.3	85	1.2	19	N.S.	
1865	M	76	Anaplastic Carcinoma Scar of Upper Lobe, Right Lung	2.5	87	0.66	101.6	<5	4.0	<5	4.1
2465	M	49	Carcinoma of Lung	N.S.		<0.2	128	<4	5.6	<4	5.0
2665	M	69	Ruptured Aortic Aneurysm	1.1	158	0.46	79	125	8.8	4.1	11.1
3165	M	57	Coronary Heart Disease	0.21	170	1.2	183	<0.9	25	<10	1.6
0166	M	75	Carcinoma of Lung	2.5	66	0.63	203	N.S.		<4	5.6
5467	M	59	Carcinoma, Left Lung	1.2	322	<0.07	324	<8	182	<6	4

Appendix - Table 2

CONCENTRATION OF PLUTONIUM IN CONTROLLED TISSUE SAMPLES

OTHERS HAVING HAD HANFORD WORK EXPERIENCE+

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
2768	M	63	Uremia - Aortic-iliac Bypass	<0.02	1036	0.38	225	<5	81	<2	10
2968	M	59	Carcinoma of Lung	<0.05	434	<0.1	233	<4	62	<6	4
3168	M	68	Carcinoma of Colon	<0.06	402	<0.1	215	<5	58	<5	4.5
3268	M	59	Fibrosarcoma from Leg	<0.03	792	<0.1	205	<4	64	<4	10.8
4468	M	55	Coronary Heart Disease	<0.04	572	<0.1	209	<5	45	<5	4.3
0369	M	86	Carcinoma of Prostate	<0.07	310	<0.09	250	<4	116	N.S.	
0469	M	65	Coronary Heart Disease	<0.03	860	0.22	180	<3	154	<1	23.4
1169	M	65	Bronchogenic Carcinoma	0.67	875	<0.2	133	<6	69	<1	18.7
1269	M	56	Coronary Heart Disease	<0.05	478	0.34	132	<7	108	9.8	6.9
3869	F	53	Carcinoma of Right Lung	<0.05	430	<0.1	160	<4	92	N.S.	
4569	M	58	Coronary Heart Disease	2.6	618	<0.09	228	<6	96	1	15.7
5469	M	62	Dissecting Aneurysm Aorta	<0.05	420	<0.1	170	<3	150	N.S.	
3970	M	58	Coronary Heart Disease	<0.1	177	<0.2	137	<8	156	3	8.8

*Sample weights estimated

+This table may contain reuslts from former plutonium workers not yet identified.

Appendix - Table 3

PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
1951	F	55	Cirrhosis of Liver	<4	40	<4	34	<12	12	N.S.	
0852	F	33	Reticulum Cell Sarcoma	<5	30*	<5	30*	<20	8*	N.S.	
1052	F	27	Cerebellar Hemorrhage	<5	30*	N.S.		<20	8*	N.S.	
1152	M	53	Ruptured Aneurysm of Aorta	<5	30*	<5	30*	<20	8*	N.S.	
1352	F	51	Carcinoma of Stomach	<5	30*	<5	30*	<20	8*	N.S.	
1652	M	47	Bronchogenic Carcinoma	<5	30*	<5	30*	<20	8*	N.S.	
1952	F	51	Ruptured Aneurysm of Aorta	<5	30*	<5	30*	<20	8*	N.S.	
2052	F	81	Carcinoma of Esophagus	<5	30*	<5	30*	<20	8*	N.S.	
2152	F	86	Calculus of Common Bile Duct, Peritonitis	<5	30*	<5	30*	<20	8*	N.S.	
2652	F	40	Carcinoma of Ovary	<5	30*	<5	30*	<20	8*	N.S.	
3052	F	32	Lymphosarcoma	<5	30*	<5	30*	<20	8*	N.S.	
3252	M	65	Bronchogenic Carcinoma	<5	30*	<5	30*	<20	8*	N.S.	
3552	F	47	Acute Granulocytic Leukemia	<5	30*	<5	30*	<20	8*	N.S.	
3752	F	40	Cerebral Hemorrhage	<5	30*	<5	30*	<20	8*	N.S.	
4352	F	55	Carcinoma of Thyroid Gland	<5	30*	<5	30*	<20	8*	N.S.	
4452	F	68	Pulmonary Embolism	<5	30*	<5	30*	<20	8*	N.S.	
0253	F	81	Pulmonary Embolism	<5	30*	<5	30*	<20	8*	N.S.	

0012546

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Trachco-bronchial Lymph Nodes fCi/gram	Trachco-bronchial Lymph Nodes Wt gram
1951	F	55	Cirrhosis of Liver	<4	40	<4	34	<12	12	N.S.	
0852	F	33	Reticulum Cell Sarcoma	<5	30*	<5	30*	<20	8*	N.S.	
1052	F	27	Cerebellar Hemorrhage	<5	30*	N.S.		<20	8*	N.S.	
1152	M	53	Ruptured Aneurysm of Aorta	<5	30*	<5	30*	<20	8*	N.S.	
1352	F	51	Carcinoma of Stomach	<5	30*	<5	30*	<20	8*	N.S.	
1652	M	47	Bronchogenic Carcinoma	<5	30*	<5	30*	<20	8*	N.S.	
1952	F	51	Ruptured Aneurysm of Aorta	<5	30*	<5	30*	<20	8*	N.S.	
2052	F	81	Carcinoma of Esophagus	<5	30*	<5	30*	<20	8*	N.S.	
2152	F	86	Calculus of Common Bile Duct, Peritonitis	<5	30*	<5	30*	<20	8*	N.S.	
2652	F	40	Carcinoma of Ovary	<5	30*	<5	30*	<20	8*	N.S.	
3052	F	32	Lymphosarcoma	<5	30*	<5	30*	<20	8*	N.S.	
3252	M	65	Bronchogenic Carcinoma	<5	30*	<5	30*	<20	8*	N.S.	
3552	F	47	Acute Granulocytic Leukemia	<5	30*	<5	30*	<20	8*	N.S.	
3752	F	40	Cerebral Hemorrhage	<5	30*	<5	30*	<20	8*	N.S.	
4352	F	55	Carcinoma of Thyroid Gland	<5	30*	<5	30*	<20	8*	N.S.	
4452	F	68	Pulmonary Embolism	<5	30*	<5	30*	<20	8*	N.S.	
0253	F	81	Pulmonary Embolism	<5	30*	<5	30*	<20	8*	N.S.	
1453	M	52	Coronary Heart Disease	<5	30*	<5	30*	<20	8*	N.S.	

Appendix - Table 3

PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
2353	F	64	Intestinal Obstruction	<5	30*	<5	30*	<20	8*	N.S.	
0454	F	43	Bilateral Nephrolithiasis	<5	30*	<5	30*	<20	8*	N.S.	
2654	F	41	Cerebral Hemorrhage	<0.8	28	<0.9	26	<5	5	N.S.	
3454	M	30	Encephalomalacia- Malignant Brain Tumor	<0.3	74	<0.8	27	<2	10	N.S.	
3554	F	58	Acute Enteritis	<0.7	34	<.018	28	<5	4	N.S.	
0255	F	29	Hemorrhagic Infarction of Small Intestine	<0.4	62	<0.4	50	<5	4	N.S.	
0355	F	61	Pemphigus Vulgarus	<0.9	26	<0.4	64	<0.8	30	N.S.	
0455	M	15	Ewing's Tumor, Metastases	<0.5	45	<0.3	67	<0.7	32	N.S.	
0655	F	22	Idiopathic Epilepsy	<0.3	70	<0.7	32	<3	8	N.S.	
0755	F	84	Arterial Thrombosis	<0.5	41	<0.6	36	<5	4	N.S.	
1755	F	7	Cerebellar Hemorrhage	<0.6	38	<0.7	30	<6	4	N.S.	
2155	F	24	Postpartum Pulmonary Infarcts	<0.4	63	<0.8	26	<4	6	N.S.	
2755	F	19	Chronic Ulcerative Colitis	<0.5	44	<0.7	32	<4	6	N.S.	
1855	F	45	Carcinoma of Stomach	<0.7	32	<0.6	38	<4	5	N.S.	
1956	F	49	Laennec's Cirrhosis of Liver	<0.4	59	<0.8	28	<4	5	N.S.	
2656	F	67	Lymphosarcoma	<0.2	102	<0.9	26	<5	4	N.S.	
2756	M	43	Bronchogenic Carcinoma	0.35	69	<1	21	<4	6	N.S.	

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
2353	F	64	Intestinal Obstruction	<5	30*	<5	30*	<20	8*	N.S.	
0454	F	43	Bilateral Nephrolithiasis	<5	30*	<5	30*	<20	8*	N.S.	
2654	F	41	Cerebral Hemorrhage	<0.8	28	<0.9	26	<5	5	N.S.	
3454	M	30	Encephalomalacia- Malignant Brain Tumor	<0.3	74	<0.8	27	<2	10	N.S.	
3554	F	58	Acute Enteritis	<0.7	34	<.018	28	<5	4	N.S.	
0255	F	29	Hemorrhagic Infarction of Small Intestine	<0.4	62	<0.4	50	<5	4	N.S.	
0355	F	61	Pemphigus Vulgarus	<0.9	26	<0.4	64	<0.8	30	N.S.	
0455	M	15	Ewing's Tumor, Metastases	<0.5	45	<0.3	67	<0.7	32	N.S.	
0655	F	22	Idiopathic Epilepsy	<0.3	70	<0.7	32	<3	6	N.S.	
0755	F	84	Arterial Thrombosis	<0.5	41	<0.6	36	<5	4	N.S.	
1755	F	7	Cerebellar Hemorrhage	<0.6	38	<0.7	30	<6	4	N.S.	
2155	F	24	Postpartum Pulmonary Infarcts	<0.4	63	<0.8	26	<4	6	N.S.	
2755	F	19	Chronic Ulcerative Colitis	<0.5	44	<0.7	32	<4	6	N.S.	
1855	F	45	Carcinoma of Stomach	<0.7	32	<0.6	38	<4	5	N.S.	
1956	F	49	Laennec's Cirrhosis of Liver	<0.4	59	<0.8	28	<4	5	N.S.	
2656	F	67	Lymphosarcoma	<0.2	102	<0.9	26	<5	4	N.S.	
2756	M	43	Bronchogenic Carcinoma	0.35	69	<1	21	<4	6	N.S.	
3456	F	49	Acute Enterocolitis and Peritonitis	<0.6	38	<0.9	25	<4	6	N.S.	

PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
0157	F	34	Intestinal Obstruction	<1	20	<0.8	26	<5	4	N.S.	
1857	F	39	Carcinoma of Breast	<0.6	38	<0.8	28	<3	8	N.S.	
2157	F	49	Ruptured Cerebral Aneurysm	<0.6	34	<0.6	39	<4	6	N.S.	
3057	F	50	Multiple Myeloma with Nephrosis	<0.5	43	<0.7	32	<4	6	N.S.	
0258	M	66	Coronary Heart Disease	<0.2	49	0.54	23	7.7	6	N.S.	
0358	F	19	Obliterative Bronchiolitis	0.56	22	0.80	28	<1	10	N.S.	
1458	F	40	Virus Pneumonitis	0.56	41	1.4	21	<2	6	N.S.	
2358	F	39	Acute Broncho Pneumonitis	<0.2	60	<0.5	24	<3	4	N.S.	
2458	F	54	Laennec's Cirrhosis of Liver	<0.3	40	<0.5	23	<3	4	N.S.	
2558	F	47	Malignant Melanoma	<0.4	28	<0.5	20	<2	5	N.S.	
2858	F	83	Acute Peritonitis	<0.4	32	<0.4	29	<2	5	N.S.	
3658	M	17	Trauma	<0.4	30	0.45	28	<1	12	N.S.	
3758	F	52	Coronary Heart Disease	<0.4	32	N.S.		<2	6	N.S.	
3858	F	47	Coronary Heart Disease	<0.4	26	1.0	18	<3	4	N.S.	
4358	F	61	Bronchial Asthma	0.84	30	<0.5	20	<2	7	N.S.	
4458	F	60	Acute Leukemia	<0.4	24	<0.4	30	<2	7	N.S.	
1259	F	11	Acute Encephalitis	<0.4	25	<1	13	<5	2	<5	2.2
1459	M	79	Cerebral Hemorrhage	0.60	20	0.59	33	<1	9	<5	2.3

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PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
1659	M	74	Intestinal Hemorrhage	<0.4	32	0.5	29	<2	7	<4	2.5
1759	M	72	Encephalomalacia	1.4	35	0.41	30	<1	8	<4	3.1
1959	F	12	Drowning	<0.3	36	0.77	18	<4	3	13	1.1
2859	F	61	Compound Fracture of Femur and Infection	0.45	31	2.3	27	<4	3	<10	0.8
3059	F	53	Acute Peritonitis	0.34	47	0.6	19	<2	6	<2	6.5
0160	F	69	Cerebral Hemorrhage	0.33	71	0.82	31	<2	5	N.S.	
0260	F	50	Drowning [redacted]	0.55	34	<0.4	27	<4	3	N.S.	
1960	F	60	Adenocarcinoma of Uterus	0.44	77	<0.5	20	<1	10	<10	0.8
2260	F	62	Carcinoma of Esophagus	<0.4	28	<0.4	28	<3	4	<20	0.5
4260	F	28	Diabetic Glomerulosclerosis	<0.2	46	<1	14	<4	3	<2	5
0761	F	31	Chronic Granulocytic Leukemia	<0.3	40	<1	14	<2	5	<10	1.1
1061	M	43	Bronchogenic Carcinoma	<0.4	30	<0.7	16	<3	4	<1	10.5
1161	M	75	Coronary Heart Disease	<0.2	50	<0.4	31	<3	4	<2	6.5
1361	F	57	Carcinoma of Breast	<0.6	18	<0.5	22	<4	3	20	0.5
1561	M	44	Trauma	<0.3	44	<0.3	34	<1	8	<5	2.1
2361	F	39	Carcinoma of Colon	<0.4	30	<0.8	15	<4	3	<8	1.4
2961	M	15	Trauma	<0.4	33	<0.5	21	<5	2	<2	5.7

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Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
1659	M	74	Intestinal Hemorrhage	<0.4	32	0.5	29	<2	7	<4	2.5
1759	M	72	Encephalomalacia	1.4	35	0.41	30	<1	8	<4	3.1
1959	F	12	Drowning	<0.3	36	0.77	18	<4	3	13	1.1
2859	F	61	Compound Fracture of Femur and Infection	0.45	31	2.3	27	<4	3	<10	0.8
3059	F	53	Acute Peritonitis	0.34	47	0.6	19	<2	6	<2	6.5
0160	F	69	Cerebral Hemorrhage	0.33	71	0.82	31	<2	5	N.S.	
0260	F	50	Drowning	0.55	34	<0.4	27	<4	3	N.S.	
1960	F	60	Adenocarcinoma of Uterus	0.44	77	<0.5	20	<1	10	<10	0.8
2260	F	62	Carcinoma of Esophagus	<0.4	28	<0.4	28	<3	4	<20	0.5
4260	F	28	Diabetic Glomerulosclerosis	<0.2	46	<1	14	<4	3	<2	5
0761	F	31	Chronic Granulocytic Leukemia	<0.3	40	<1	14	<2	5	<10	1.1
1061	M	43	Bronchogenic Carcinoma	<0.4	30	<0.7	16	<3	4	<1	10.5
1161	M	75	Coronary Heart Disease	<0.2	50	<0.4	31	<3	4	<2	6.5
1361	F	57	Carcinoma of Breast	<0.6	18	<0.5	22	<4	3	<20	0.5
1561	M	44	Trauma	<0.3	44	<0.3	34	<1	8	<5	2.1
2361	F	39	Carcinoma of Colon	<0.4	30	<0.8	15	<4	3	<8	1.4
2961	M	15	Trauma	<0.4	33	<0.5	21	<5	2	<2	5.7
3061	F	55	Corpulmonale	<0.4	28	0.62	19	<4	3	N.S.	

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PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
3361	M	68	Coronary Heart Disease	0.24	54	<0.7	17	<2	5	<2	5.1
3461	M	40	Cerebral Hemorrhage	0.63	28	<0.7	17	<3	4	5.4	4.6
4061	F	65	Encephalomalacia	<0.5	22	<0.6	18	<5	2	<10	1.1
4261	F	68	Carcinoma of Breast	<0.5	22	0.84	22	<5	2	<20	0.7
0162	F	59	Coronary Heart Disease	<0.3	43	<0.5	22	<3	4	<8	1.4
0362	M	72	Cerebral Hemorrhage	<0.2	47	<0.5	20	<2	6.5	<3	3.3
0962	F	49	Trauma	<0.3	37	0.35	38	<4	2.8	<5	2.4
1062	F	57	Carcinoma of Ovaries	<0.4	31	0.66	38	<3	4.2	<10	1.2
1162	M	56	Carcinoma of Colon	<0.2	52	<0.5	20	<3	3.9	<10	1.1
1562	M	39	Coronary Heart Disease	N.S.		<0.4	30*	<1	8*	<3	4*
2262	F	54	Pulmonary Emboli	<0.4	26	<0.4	30	<3	4.0	<3	4.0
2662	F	54	Coronary Heart Disease	<0.2	51	<1	12	<5	2.0	<10	1.0
2762	F	77	Encephalomalacia	<0.4	30*	<0.4	30*	<1	8*	<3	4*
3262	M	60	Cerebellar Hemorrhage	<0.5	20	<0.3	40	<3	4.0	<5	2.0
3462	F	59	Coronary Heart Disease	<0.6	19	<0.7	17	<4	3.0	<10	1.0
3662	M	75	Intrahepatic Cholangitis	N.S.		<0.7	16	<3	4.0	<5	2.0
3862	M	59	Carcinoma of Adrenal Cortex	0.11	108	<0.3	37	<2	5.0	<10	1.0
4462	F	43	Primary Pulmonary Hypertension	<0.2	56	<0.5	20	<2	7.0	<10	1.0

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PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Node fCi/gram	Tracheo-bronchial Lymph Node Wt gram
5162	F	73	Carcinoma of Colon	1.3	14	<0.4	26	<3	4.0	<10	1
0763	F	52	Metastases from Carcinoma of Colon	<0.4	32	<0.8	14	<4	3.0	<5	2.0
2763	F	44	Hemorrhagic Infarction of Small Intestine and Cecum	0.87	37	0.50	38	<5	2.0	<2	4.6
3263	F	56	Hodgkin's Disease	0.32	79	<0.4	28	<2	6.7	<2	4.8
3763	F	49	Metastases From Carcinoma of Breast	1.2	40	<0.8	14	<4	3.0	<10	1.0
3963	F	65	Carcinoma of Ovary	0.46	53	<0.4	27	<2	4.8	<9	1.3
4263	M	53	Carcinoma of Stomach [redacted]	0.34	123	<0.2	73	<1	8.0	<4	3.0
4463	F	64	Malignant Brain Tumor	0.46	97	<0.1	87	<2	5	<4	3.0
5263	F	66	Coronary Heart Disease	0.24	135	0.28	193	<2	7.0	<2	5.0
5463	M	79	Cerebral Hemorrhage	0.51	85	<0.2	75	<1	8.7	<2	5.0
5663	F	75	Acute Rheumatic Myocarditis	0.29	54	<0.4	31	<4	3.0	<4	3.0
0564	M	46	Coronary Heart Disease	0.40	159	N.S.		N.S.		<4	3.0
0964	F	68	Adenocarcinoma of Pancreas	0.75	96	0.23	157	<1	10	<4	3
1364	F	59	Cerebral Thrombosis	0.26	204	<0.1	80	<0.4	28	<2	6
2364	F	87	Hemorrage From Duodenal Ulcer	0.13	169	<0.1	111	<4	2.6	<2	5
2664	F	43	Subarachnoid Hemmorhage	N.S.		N.S.		N.S.		<5	2.3
4164	F	73	Cerebral Hemorrhage	0.33	136	0.38	106	N.S.		<5	2

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LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Node fCi/gram	Tracheo-bronchial Lymph Node Wt gram
5162	F	73	Carcinoma of Colon	1.3	14	<0.4	26	<3	4.0	<10	1
0763	F	52	Metastases from Carcinoma of Colon	<0.4	32	<0.8	14	<4	3.0	<5	2.0
2763	F	44	Hemorrhagic Infarction of Small Intestine and Cecum	0.87	37	0.50	38	<5	2.0	<2	4.6
3263	F	56	Hodgkin's Disease	0.32	79	<0.4	28	<2	6.7	<2	4.8
3763	F	49	Metastases From Carcinoma of Breast	1.2	40	<0.8	14	<4	3.0	<10	1.0
3963	F	65	Carcinoma of Ovary	0.46	53	<0.4	27	<2	4.8	<9	1.3
4263	M	53	Carcinoma of Stomach	0.34	123	<0.2	73	<1	8.0	<4	3.0
4463	F	64	Malignant Brain Tumor	0.46	97	<0.1	87	<2	5	<4	3.0
5263	F	66	Coronary Heart Disease	0.24	135	0.28	193	<2	7.0	<2	5.0
5463	M	79	Cerebral Hemorrhage	0.51	85	<0.2	75	<1	8.7	<2	5.0
5663	F	75	Acute Rheumatic Myocarditis	0.29	54	<0.4	31	<4	3.0	<4	3.0
0564	M	46	Coronary Heart Disease	0.40	159	N.S.		N.S.		<4	3.0
0964	F	68	Adenocarcinoma of Pancreas	0.75	96	0.23	157	<1	10	<4	3
1364	F	59	Cerebral Thrombosis	0.26	204	<0.1	80	<0.4	28	<2	6
2364	F	87	Hemorrage From Duodenal Ulcer	0.13	169	<0.1	111	<4	2.6	<2	5
2664	F	43	Subarachnoid Hemmorhage	N.S.		N.S.		N.S.		<5	2.3
4164	F	73	Cerebral Hemorrhage	0.33	136	0.38	106	N.S.		<5	2
4964	F	81	Coronary Heart Disease	0.24	151	0.42	127	<1	10	<5	2

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PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Trachco-bronchial Lymph Nodes fCi/gram	Trachco-bronchial Lymph Nodes Wt gram
5564	F	44	Carcinoma of Breast	0.44	122	<0.1	177	<3	8.8	N.S.	
5664	F	63	Carcinoma of Nasopharynx	<0.1	161	0.24	245	<3	8	<10	2.3
0165	M	27	Ruptured Aorta (auto accident)	1.2	70	1.0	153	<2	13.3	<5	5
0265	F	54	Subacute Glomerulonephritis	0.38	131	0.23	182	<0.1	212	<9	2.5
0565	F	57	Coronary Heart Disease	0.13	170	0.26	279	<2	14.8	<10	2
0665	F	46	Carcinoma of Cervix	<0.2	89	0.38	199	<1	23	N.S.	
1065	M	79	Adenocarcinoma of Kidney	1.1	28	0.12	235	<2	14.8	<7	3.4
1165	M	64	Ruptured Anastomosis at site of Operated Abdominal Aortic Aneurysm	0.34	80	N.S.		<0.9	24	<5	4.6
2065	F	57	Coronary Heart Disease	2.6	147	1.3	120	<5	4.7	<5	4.4
2165	F	67	Bronchogenic Carcinoma	<0.2	149	0.68	103	<9	2.5	144	0.2
2365	F	63	Cerebellar Hemorrhage	2.1	25	2.1	129	<6	3.7	<100	0.2
2765	M	72	Bacterial Endocarditis	0.26	215	<0.3	89	<0.8	27	<5	4.1
2865	M	55	Adenocarcinoma of Rectum	0.62	140	1.9	100	<1	16.1	N.S.	
0266	F	37	Lupoid Hepatitis	0.21	123	<0.2	95	<3	7.3	<20	1.4
0766	M	20	Acute Myocarditis	<0.2	142	0.90	56	<6	3.7	<3	6.7
2467	F	67	Coronary Heart Disease	0.12	280	<0.2	133	49	201	<5	4.7
3267	M	50	Coronary Heart Disease	<0.03	855	<0.26	227	2.8	25.3	N.S.	
3567	F	35	Ulcerative Colitis	<0.04	530	0.20	222	2.5	37.8	N.S.	

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PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
3767	F	54	Carcinoma of Duodemun	0.24	406	0.35	234	<1	23.5	N.S.	
3867	F	74	Carcinoma of Breast	<0.07	328	0.50	196	<0.7	32.3	N.S.	
3967	F	61	Pulmonary Emphysema	<0.05	476	1.0	226	5.2	21.5	N.S.	
4167	F	53	Mitral Stenosis	<0.04	638	0.18	304	5.7	66	N.S.	
4267	F	55	Cerebral Aneurysm	0.076	327	1.7	195	<0.4	53	N.S.	
4367	M	49	Acute Liver Failure	<0.04	618	0.20	224	9.3	58	N.S.	
5967	M	77	Carcinoma of Kidney	<0.06	372	<0.08	278	<9	133	<3	7.5
2368	F	48	Coronary Heart Disease	<0.05	425	0.16	199	<1	36	<4	5.5
2568	F	79	Ulcerative Colitis	0.091	402	<0.1	197	2.9	12	<8	2.7
2668	F	50	Carcinoma of Ileum	0.10	231	0.10	247	<3	63	<20	1
2868	F	80	Gangrene of Small Intestine	<0.07	322	<0.1	230	<2	66	<10	2
3468	F	50	Lymphosarcoma of Stomach	<0.05	477	<0.1	227	<2	53	<20	1.1
3768	F	65	Cirrhosis of Liver	<0.06	386	<0.2	106	<4	51	<7	3.1
3868	F	51	Carcinoma of Breast	<0.05	453	0.39	240	2.0	51	<15	3.0
3968	F	84	Cerebral Thrombosis	<0.07	335	<0.1	212	<4	39	<8	2.7
1469	F	75	Coronary Heart Disease	<0.1	220	<0.1	200	<4	140	N.S.	

Appendix - Table 3

PLUTONIUM IN TISSUE SAMPLES

LOCAL RESIDENTS FOR MORE THAN 3 YEARS

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
2069	F	68	Carcinoma of Pancreas	<0.4	57	N.S.		N.S.		N.S.	
2869	M	59	Carcinoma of Colon	<0.05	450	<0.09	250	<2	100	N.S.	
5369	F	48	Acute Pancreatitis	<0.1	220	<0.1	210	<5	110	<5	4.1
5769	F	47	Cerebral Vascular Accident	0.49	120	<0.06	360	N.S.		N.S.	
2870	M	63	Bronchogenic Carcinoma	<0.06	349	<0.08	294	<3	208	N.S.	

*Sample weights estimated.

0012560

Appendix - Table 4

CONCENTRATIONS OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

INDIVIDUALS NOT RESIDING LOCALLY

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
0149	M	21	Trauma	<5	30*	<5	30*	<20	8*	N.S.	
4249	F	36	Cerebral Hemorrhage	<5	30*	<5	30*	<20	8*	N.S.	
0550	F	70	Cerebral Thrombosis with Encephalomalacia	N.S.		<5	30*	<20	8*	N.S.	
1050	M	34	Trauma	<4	34	6.5	51	N.S.		N.S.	
1151	M	67	Acute Peritonitis	<5	30*	<5	30*	<20	8*	N.S.	
2452	F	60	Biliary Fistula (Post Cholecystectomy)	<5	30*	<5	30*	<20	8*	N.S.	
2552	F	41	Carcinoma of Breast	<5	30*	<5	30*	<20	8*	N.S.	
2952	F	52	Carcinoma of Stomach	<5	30*	<5	30*	<20	8*	N.S.	
4052	M	48	Cerebral Thrombosis	<5	30*	<5	30*	<20	8*	N.S.	
0154	F	32	Synovial Sarcoma	<0.8	30*	<0.8	30*	<3	8*	N.S.	
0356	M	73	Bronchogenic Carcinoma	<0.6	40	<0.5	43	<4	5.5	N.S.	
1657	F	59	Generalized Lymphosarcoma	1.8	21	<0.8	29	5.7	4.8	N.S.	
1757	F	80	Chronic Lymphatic Leukemia	<0.7	32	<0.9	25	<4	6.3	N.S.	
2757	F	65	Carcinoma of Pancreas	<1	16	<1	22	<3	6.8	N.S.	
2958	F	11	Cavernous Sinus Thrombosis Acute Meningitis	<0.5	20	<0.4	29	<3	4.4	N.S.	
4158	M	70	Postoperative after Prostatectomy, Acute Enterocolitis	0.51	34	<0.7	16	<3	4.5	N.S.	
3060	F	79	Acute Bronchopneumonia	0.35	37	<0.5	22	<3	4.5	<3	3.3

0012561

Appendix - Table 4

CONCENTRATIONS OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

INDIVIDUALS NOT RESIDING LOCALLY

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
3560	M	39	Trauma	<0.5	19	<0.5	21	<3	4.9	<10	0.9
3760	M	56	Encephalomalacia	N.S.		<0.5	23	<3	4.5	N.S.	
3960	M	62	Ruptured Cerebral Aneurysm	<0.2	59	<0.4	28	<1	10.7	<10	1.0
0561	F	41	Bronchial Asthma	0.34	30	<0.5	24	<3	4.3	<5	2.2
1761	M	86	Carcinoma of Prostate	0.36	61	0.22	70	<3	3.7	<10	0.9
3661	M	55	Bronchogenic Carcinoma	<0.5	24	<0.5	21	<2	6.3	<3	3.1
3961	F	47	Ruptured Cerebral Aneurysm	<0.4	25	<0.4	27	<4	2.7	<20	0.7
4961	F	29	Malignant Brain Tumor	<0.4	28	<0.5	24	<5	1.9	<20	0.6
1362	M	26	Trauma	<0.4	32	<0.5	19	<5	2.0	<10	1.0
1462	M	78	Acute Bronchopneumonia	<0.2	56	<0.4	29	<3	4	<4	3
1862	F	62	Subdural Hematoma after Trauma	<0.4	30*	<0.4	30*	<1	8*	<3	4*
1962	M	35	Extradural Hematoma	0.86	21	<0.5	21	<1	8*	<5	2.0
2962	F	45	Ruptured Cerebral Aneurysm	<0.4	30*	<0.4	30*	<1	8*	<3	4*
3062	M	48	Malignant Brain Tumor	<0.4	30*	<0.4	30*	<1	8*	<[illegible]	4*
4062	M	67	Trauma	<0.3	40	<0.5	23	3.6	5	<4	3
5262	F	85	Postoperative-Synpathectomy	<0.5	22	0.46	35	<4	2.6	<5	2
0463	M	77	Bronchogenic Carcinoma	<0.37	44	<1	14	<1	9	<[illegible]	3

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CONCENTRATIONS OF PLUTONIUM IN POST-MORTEM TISSUE SAMPLES

INDIVIDUALS NOT RESIDING LOCALLY

Case No	Sex	Age at Death	Cause of Death or Major Disease	Lung fCi/gram	Lung Wt gram	Liver fCi/gram	Liver Wt gram	Bone fCi/gram	Bone Wt gram	Tracheo-bronchial Lymph Nodes fCi/gram	Tracheo-bronchial Lymph Nodes Wt gram
1163	M	66	Carcinoma of Colon	<0.2	59	<0.5	22	<2	5	<2	6
2563	F	58	Atrophy of Pituitary, Adrenals and Thyroid Gland	0.22	74	0.48	31	<2	4.7	<2	5
3863	M	82	Carcinoma of Prostate	0.18	79	0.51	26	<2	5.3	<3	3.3
0364	F	84	Hypertension and Uremia	0.18	86	0.19	231	<2	5	<10	1
0764	M	82	Chronic Lymphocytic Leukemia	<0.1	86	<0.4	26	<2	7	68	5
3264	F	70	Carcinoma of Kidney	0.31	86	0.20	66	<0.5	24	6.3	5
3664	F	50	Carcinomatosis	0.69	130	N.S.		N.S.		6.0	3
3764	F	71	Hypertension, Diabetes	N.S.		0.39	172	N.S.		<2	5.3
5764	M	61	Emphysema	<0.04	253	0.72	268	<1	10.4	N.S.	
4665	F	68	Acute Pancreatitis	<0.3	87	0.18	180	N.S.		<10	2
4867	F	36	Scleroderma	0.63	322	<0.08	264	<7	220	6.2	4.4
2468	F	32	Cerebral Aneurysm	<0.06	346	1.1	217	<5	23	<5	4.3
3769	M	46	Coronary Heart Disease	<0.06	350	<0.08	270	<2	290	<6	3.8
4469	M	53	Carcinoma of Colon	<0.04	580	<0.05	490	N.S.		<3	8.2
3570	F	74	Carcinoma of Breast	<0.07	320	0.16	170	<5	180	N.S.	
3670	F	48	Subarachnoid Hemorrhage	<0.1	181	<0.1	165	<3	101	<4	5.7

*Sample weights estimated.

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