

March 5, 1973

TO: CHR Records Room
FROM: J. Rundo, K. F. Eckerman
SUBJECT: In vivo counting - case 40-009

RECEIVED

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1. This subject, a 75-year old white female, was hospitalised at the Strong Memorial Hospital, Rochester, N.Y., in the care of Dr. Christine Waterhouse. We took electronic equipment and counters to Rochester in an attempt to detect uranium L X-rays from the subject's purative burden of plutonium-239. We drove to Rochester on February 6, spent most of February 7 setting up and testing the equipment and made our measurements on the morning of February 8. After making background measurements on a control subject, we dismantled the equipment that afternoon and drove back on February 9.
2. By mid-morning, the proportional counter and associated electronic equipment were set up, tested and operating satisfactorily. A 40-minute background gave 6.2 counts/minute in the energy band 14-23 keV and this band was used for all measurement results reported below.
3. The principal problems encountered were of a mechanical nature; securing the counter to the detector mounting was the main one. The local workshop personnel made a bracket which was used successfully but there were severe difficulties in presenting the counter to the patient because (a) the room was very small (about 5 feet x 6 feet), (b) the suspension device was cumbersome and inflexible, and (c) there was only a tilting chair and no bed or stretcher.
4. Three measurements were made of the subject's X-ray emission: from the general region of the liver, from the left side at the same level, and from the left side of the face. Two background measurements were made on a female control subject, who was not however a particularly good match because she weighed 55 kg compared with the patient's 65 kg. This is not considered too important except that it was impossible to get the counter as close to her body surface as to that of the patient.

PROVENANCE

REPOSITORY: OFFICE OF HUMAN RADIATION
EXPERIMENTS (OHRE)

COLLECTION: PLUTONIUM INJECTION INVESTIGATION
FILES (OHRE 1)

BOX: 3

FOLDER: PLUTONIUM - CHR

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5. The results are summarised in the following table (counter background not subtracted). Apparently some activity was detected from the left and right upper quadrants.

<u>Location</u>	<u>Case 40-009</u> <u>c/min.</u>	<u>Control subject</u> <u>c/min.</u>	<u>Difference</u> <u>c/min.</u>
Face	8.7 ± 0.7	7.7 ± 0.6	1.0 ± 0.9
Liver	12.5 ± 0.8	(9.4 ± 0.7) *	3.1 ± 1.1
L. side	11.6 ± 0.8	9.4 ± 0.7	2.2 ± 1.1

* Assumed to be the same as the measured value on the left side.

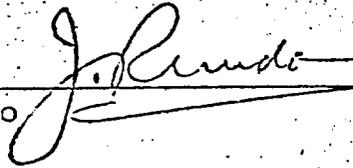
6. A crude calibration was made at CHR with a point source buried at 25 different positions in a solid phantom. The calibration factor was 0.15 c/min per nCi ^{239}Pu . Attributing all the counts observed from the patient's liver region to plutonium in the liver, we deduce a liver content of 20 nCi. This is only 6.7% of the injected dose of 300 nCi, whereas three out of five autopsied patients had in excess of 20% in the liver. The other two showed advanced liver disease. It should be noted that patient 40-009 had infectious hepatitis at the time plutonium was administered and this may have affected the liver deposition. Not too much reliance should be placed on the figure of 20 nCi because of the crudity of the calibration; it is likely to be low rather than high but it is difficult to envisage it being low by more than a factor of two and certainly not as much as a factor of ten.
7. The response observed from the left upper quadrant could have come from the median portion of the liver, as the counter could not be placed completely to the left or right of the mid-line. An alternative possibility would be a contribution from plutonium deposited in the lower ribs but this would apply equally to the counts observed from the liver region, and allowance for this would make our estimate of the liver content surprisingly low.

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8. Time and especially the mechanical arrangements in the shield did not permit more extensive investigations of possible X-ray emissions from bone, but it seems clear that even at this level of activity it is doubtful if the plutonium can be detected. This substantiates a statement made by one of us at the U.N. Geneva Conference in 1958. (Proceedings, vol. 23, page 111).


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dk

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