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INTER-OFFICE MEMORANDUM

FINAL DETERMINATION
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L. M. Redman
JAN 22, 79

TO: Mr. Joseph Kennedy
Mr. Kenneth Bainbridge

DATE April 12, 1944

701492

FROM: L. H. Hempelmann

SUBJECT: Effects of Toxic Agents

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At the recent meeting of the health group in Chicago J. G. Hamilton reported on the results of his studies on the metabolism of plutonium. The following statements are based on experiments in which 15 micrograms of plutonium salt (chloride in the +3 valence state, nitrate in the +4 and +6 states) was given to a series of rats by the usual three routes (orally, intra-pulmonarily, and intra-muscularly).

The studies indicated that plutonium in all three valence states is very poorly absorbed when taken by mouth,--less than .005%.

(1) When introduced into the lung and into the muscle, the +4 valence state was very poorly absorbed, resembling zirconium in this respect. In the case of the nitrate given intra-muscularly, only 12% was absorbed from the muscle in 16 days. When introduced into the lung, 93% was still present in this organ after four days.

(2) In the case of the +3 salt, 30% was absorbed from the muscle in 16 days, and 55% was absorbed from the lungs.

(3) The +6 state was the most readily absorbed of all. 68% was absorbed from the muscle in 16 days, and 68% from the lungs.

In all these cases the organ which took up most of the absorbed plutonium was the bone, with more than half of the element going to the skeletal system in each case.

Conversation with the various members of the health groups from other projects indicated that very little is known about the metabolism and toxicity of polonium. In the literature, the only pertinent study was published in 1913. This indicated that the lethal dose of polonium for rabbits was 120 microcuries injected into a 3.9 kilogram rabbit. This amount will kill a rabbit within seven days and is comparable in effect to about 1,000 Roentgen units of x-rays. Using this figure, the lethal dose of polonium for a 50 kilogram man, on the basis of weight, would be about 1.5 millicuries. Because the tolerance of various species of animals differs, it seems probable that the actual lethal dose will probably be considerably less than this figure. Assuming the above figure to be correct, however, the tolerance dose would be .0001 of the above figure, or 1.5 microcuries.

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TO: Mr. Joseph Kennedy
Mr. Kenneth Bainbridge

DATE April 12, 1944

FROM: L. H. Hempelmann

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In view of the above information, it would seem wise to continue all the precautions which have been instituted in Building D. Even though little seems to be absorbed by mouth, the problems of ingestion and inhalation are so closely related that it would seem wise to me not to mention this fact to the men working with the material.

Discussion with the men concerned with health in other projects seemed to indicate that nose counts are the most reliable methods of determining whether or not people are being exposed to these toxic agents. Since any absorbed material will tend to go to bone, blood counts will give evidence of over-dosage,-- but not until a relatively late stage. There are certain tests of organic components on the blood, such as nucleoprotein and lipoid phosphorus, which might give earlier evidence of local tissue damage, which might occur in the lung. It is hoped that we shall be able to undertake these tests on the people who are receiving the most exposure, as judged by the nose counts.

CC to Mr. Popham

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