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Question 11

Battelle
Pacific Northwest Laboratories

Project Number

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S. MARKS

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To Sid Marks

From Roy C. Thompson RCT

Subject HUMAN EXPERIMENTATION

The only experimentation on humans that I can recall having been done in the Biology Department since 1950 when I joined the Department, is that described in the attached reprint. These were studies of the absorption of tritium-labeled water through the intact skin. Fourteen human subjects (unidentified) were exposed over a small area (~10 cm^2) on the forearm or abdomen to a water vapor atmosphere labeled with tritium oxide; and a single subject (not identified, but known to be H. A. Kornberg) was similarly exposed over his total skin area, while breathing uncontaminated air.

The purpose of these experiments was to determine the rate of absorption of tritium oxide through the intact skin. Studies had previously been done with rats as subjects. The human data indicated about a 4-fold greater absorption rate than that measured in rats, and were important in establishing the fact that respiratory protection alone was not adequate to protect workers exposed to tritium oxide. As a direct consequences of these studies, the allowable air concentration of tritium oxide was reduced by a factor of two.

Surviving records do not indicate the concentrations of tritium attained in the exposed subjects. It can be estimated from the data reported, however, that single total body exposure must have resulted in an intake of approximately 3.3 mCi of tritium. The ICRP-30 annual limit on intake (ALI) for tritium is 3×10^9 Bq or about 81 mCi. The experimental exposure therefore amounted to about 4% of an ALI, which should have delivered a total body dose

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of about 200 mrem. The actual dose delivered was probably less than half of this, since the subject consumed large quantities of water to speed excretion of the tritium oxide. Similar estimates cannot be made for the other subjects, but their exposures, and consequent radiation dose, must have been very much lower than that of the total body exposure.

Because of the very low doses involved, no long-term follow-up was planned or performed.

RCT:pmb