

Date June 22, 1984
 To Sid Marks
 From Roy Thompson *RET*
 Subject HUMAN EXPERIMENTATION

REPOSITORY DOE-Richland
 GSFC HUMAN TEST SUBJECT STUDIES
 COLLECTION TRITIUM
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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 ($\sim 10 \text{ cm}^2$) on the forearm or abdomen to a water vapor atmosphere labeled with tritium oxide; and a single subject 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 consequence 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 of about 200 mrem. The actual dose

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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.

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FACTSHEET HUMAN EXPERIMENTATION

Project Name: Unknown.
Project involved study of
absorption of tritium oxide
through skin.

Date Started: 1951
Date Terminated: 1951

Identification: Unknown

Principal Investigator(s): Chester W. DeLong, Biology Laboratory, General Electric
Company, Richland, WA

Responsible Government Official(s):

Objective(s) of test: To determine the rate of absorption of tritium oxide through
the intact skin of man.

Short description: Fourteen human subjects were exposed over a small area ($\sim 10 \text{ cm}^2$)
on the forearm or abdomen to a water-vapor atmosphere labeled with tritium oxide (HTO).
A single human subject was similarly exposed over his total skin area while breathing
uncontaminated air. Absorption of tritium oxide was estimated by measurement of
tritium oxide subsequently excreted in the subjects' urine. The data from these experi-
ments indicated a 4-fold greater absorption rate than that measured earlier in rats.
These studies established the importance of the skin as a route of entry for tritium
oxide and led to reductions in the allowable concentration of tritium oxide in air.

Follow-up data: No follow-up was conducted because of small dose to subjects
(see Attachment 1).

References: DeLong, C. W., R. C. Thompson, and H. A. Kornberg, 1954,
Percutaneous absorption of tritium oxide. Am. J. Roentgenol.
Radium Therapy Nucl. Med. 71, 1038-1045.

Attachment(s): 1 - Memo of 06-22-84 from Roy C. Thompson to Sidney Marks.
2 - Copy of above reference.

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