SUMMARY FACTSHEET HUMAN EXPERIMENTATION - SFS11.001

Project Category: Other Biological Effects

Funding Source(s): MED

Institution(s): 1a) Clinton Laboratory
1b) New York University
1c) Oak Ridge National Laboratory
2) Harvard Medical School
3) Lawrence Radiation Laboratory
Oak Ridge Associated Universities
4) Oak Ridge National Laboratory
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Objective(s) of Project:
1) To determine the biological effects of irradiation to the skin
2) To study transplantation of tissues and whole organs
3) To evaluate the effects of internal irradiation from P-32, Y-90, Sr-90, and I-131 when therapeutically used in certain diseases, and the evaluation of the hematological response obtained from their use
4) To determine the distribution of tritium in the human body resulting from surface contamination, inhalation and ingestion

Short Description and Follow-up Data:
1a) Shielded disks of 1-inch diameter containing P-32 were used. Exposures were made by setting the source directly on the skin. Two groups of ten healthy volunteers each were exposed to doses of 140 to 1180 rep. The dose required to produce a visible reaction in 80% of the people was found to be between 170 and 200 rep. For an erythema the dose was determined to be 635 to 813 rep. (Report dated 1946.)

1b) Experiments carried out on living human skin *in situ* demonstrated that the iontophoresis of weak solutions of thorium X will increase its biological effects as judged by erythema and pigmentation, and cause greater penetration as shown by autoradiography. (Report dated 1955.)

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1c) Fifteen subjects were exposed on their left fourth finger to 200-600 R of 130kv x-rays in a single exposure. Microscopic observations were made before and after treatment. (Report dated 1947.)

2) During the period 1960 to 1963, one patient (in this report) received 250 R total body x-ray irradiation to suppress the immune reaction to a kidney transplant. Seven other patients received doses of 350 or 450 R. The treatment apparently was not successful but survival time wasn't stated.

3) During the period 1938 to 1963, internal irradiations using P-32, Y-90 and I-131 were continued and their clinical therapeutic and irradiation effects studied in patients with polycythemia, chronic leukemias, multiple myeloma, lymphogranuloses and thyroid disorders, including thyroid carcinoma. The patients receiving internal irradiation over the past 25 years have been closely followed. A high percentage post-mortem examinations have been obtained on the deceased patients.

4a) In 1950, six subjects received a few millicuries of tritium by inhalation of isotopically labeled hydrogen gas. Tritium concentration in urine was monitored for 15 subsequent days.

4b) In 1952, subjects inspired HTO saturated oxygen for 4 to 5 minutes. The HTO retained in the body during the exposure was obtained by subtracting the HTO expired from the HTO inspired.

4c) Also in 1952, measured amounts of tritium as HTO were ingested by male subjects. Venous blood and urine were monitored for tritium activity for 2-1/2 to 5 hours subsequently.

4d) The lower arm of subjects was exposed for variable lengths of time to various activities of HTO as water vapor and the HTO in water. Tritium activity in urine was monitored. (1952.)

4e) Air saturated with tritium oxide was circulated for one hour over a 9.8 cm^2 area of a male subject's forearm. Absorption was estimated from the tritium activity in urine passed several hours following exposure. (1952.)

5) In 1951, fourteen human subjects were exposed over a small area ($\sim$10 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 subject's urine. The data from these experiments 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.