
Eric
for you!

EXPERIMENTS WITH PLUTONIUM, URANIUM, AND POLONIUM

In General

- Purpose: to determine how excreta could be used to estimate the amount of plutonium that remained in an exposed person's body.
- subjects (hospitalized patients)
  - one patient at Oak Ridge Hospital in Oak Ridge, TN
  - 11 at University of Rochester.
  - three at University of Chicago
  - three at the University of California
- Consent: only one subject's record indicates consent; the other 15 showed no record of consent.
- Expected risks/benefits: no acute short-term damage expected in plutonium experiments (were expected in the uranium experiments), but long-term effects could not be ruled out. None of the experiments was believed to benefit the patients themselves.
- Resulting harm: unclear if any individual was physically harmed by the plutonium (although one patient was put at some risk of cancer); uranium experiment did cause damage to the 6th patient in the series; all the uranium subjects were put at risk of acute effects from the experiment.

Oak Ridge Injection (Plutonium)

- Date: March 24, 1945
- Purpose: to determine how excreta could be used to estimate the amount of plutonium that remained in an exposed person's body.
- Subject: 53 year-old (Mr. Ebb Cade) hospitalized for auto accident; injected with 4.7 micrograms of plutonium. Teeth and bone were taken from the man, who later died of heart failure.
- Expected risks: No short term risk, but at the time plutonium induced cancer could not be ruled out and the man was expected to live 10-20 more years.
- Consent: none.

Chicago Experiments (Plutonium)

- Date: April-December 1945
- Purpose: to determine how excreta could be used to estimate the amount of plutonium that remained in an exposed person's body.
- Subjects: 3 cancer patients (CH-1,2 and 3), chosen specifically because their life expectancy could not be endangered by the injections.
- Expected risks: No short term risk, but at the time plutonium induced cancer could not be ruled out.
- Consent: No discussion of consent in original reports, but in interview, was account that patients had been told radioactive substance was to be injected and was not necessarily for the benefit of the patient (in reality there was no expectation of benefit to the patient).

Rochester Experiments

Plutonium.

- Purpose: to determine how excreta could be used to estimate the amount of plutonium that remained in an exposed person's body.
- Subjects: selected patients who would have similar metabolism to Manhattan Engineer District workers; who were past 45 years of age suffering from chronic disorders such that survival for ten years was improbable.
- Consent: no record of consent; recollections of subjects indicate that patients did not consent and did not know they were subjects.

Uranium

- Purpose: to establish minimum dose that would produce detectable kidney damage and to measure the rate at which uranium was excreted from the body.
- Subjects: 6 hospital patients; not at risk of imminent death but did suffer from chronic medical conditions. Factors in selection included reasonably good kidney function, probability that patient would benefit from continued hospitalization and medical care.
- Expected Risks: designed to cause actual harm, however minimal; also were expected long-term risks of cancer. Damage did occur in the 6th and last patient.
- Consent: no records.

Polonium

- Purpose: to determine the excretion rate of polonium after a known dose, as well as to analyze the uptake of polonium in various tissues.
- Subjects: 5 patients, all with terminal forms of cancer.
- Consent: record mentions question of consent, but still unclear if consent was obtained.

California Experiments (Plutonium)

- Purpose: to evaluate the possible hazards to humans exposed to plutonium either in the course of the operation of the [Chicago] pile, or in the event of possible enemy action.
- Subjects (CAL-1,2 and 3; and CAL-A, respectively):
  - Albert Stevens, 58 year-old believed to have stomach cancer (injected with plutonium in May 1945) (paid to stay in the Berkeley area)
  - Simeon Shaw, 4 year-old with rare form of bone cancer (injected with plutonium, yttrium and cerium in April 1946)
  - Elmer Allen, 36 year-old believed to be suffering from bone cancer (injected with plutonium in July 1947)
  - teenage bone cancer patient (injected with americium in summer 1947)
  - 55 year-old woman with cancer (injected with zirconium on January 5, 1948) (no records on patient located so far)
- Consent:
  - CAL-1,2 -- evidence suggest likely that consent was not obtained; that information was kept secret. (partly to avoid a "devastating lawsuit" and "attendant publicity"); patients may have been misled to believe the treatments would benefit them.
  - CAL-3 -- was record of a note saying the patient had been informed of

experimental nature and had agreed, but unclear of told of potential effects.

* CAL-A -- incomplete records; nothing indicating consent.

- Expected risks/benefits: none were expected to benefit the patients themselves.

Follow-up

- Follow-up on 2 subjects (Eda Charlton and John Mousso) continued through 1953. Purpose of follow-up not revealed to patients.
- Argonne National Laboratory's Center for Human Radiobiology (CHR) began study in 1972 of the 16 patients injected with plutonium, which led to 3 patients (Eda Charlton, John Mousso and Elmer Allen) being admitted to Rochester's metabolic ward for excretion studies. No disclosure to patients as to fact that they were being followed due to plutonium injections.
- In 1974, follow-up study on exhumed bodies of deceased subjects began. Families of the subjects were not informed that plutonium had been injected.
- In 1974 two (Eda Charlton and John Mousso) of the four living subjects were informed of the plutonium injections. One living patient, Jan Stadt was not told because her physician believed it would be medically indefensible to tell her.

Boston Project Uranium Injections

- Date: 1953-1957
- Purpose: to gather human data to develop worker safety standards; to search for a radioisotope that would localize in a certain type of brain tumor and destroy them when activated by a beam of neutrons.
- Subjects: 11 patients with terminal illness were injected with uranium.
- Expected risks/benefits: no expectation that the experiment would benefit the subjects themselves. High doses used.
- Consent: no documents indicating consent. Dr. Sweet told Advisory Committee that it was his policy to give all information to the patients and obtain consent. Evidence suggests that this rule was not followed universally.

NONTHERAPEUTIC RESEARCH ON CHILDREN

In General

- Advisory Committee reviewed 21 research projects, which is only a small number of those likely conducted during 1944-1974.
- Purpose: all projects involved the administration of radioisotopes to children in order to better understand child physiology or to develop better diagnostic tools for pediatric disease. 17 of the 21 experiments involved the use of iodine 131 for the evaluation of thyroid function.
- Subjects: approximately 800 children. Little is known about the children with the exception of the Fernald and Wrentham experiments.
- Risk: in 11 of the 21 experiments the risks were in a range that would today be considered more than minimal. It is possible that 4 of the 11 might be considered. acceptable by the "minor increase over minimal risk" standard. (Tables for degree of risk for different studies is located in the Advisory Committee report, pp 356-

357. Overall, the Advisory Committee estimates an excess incidence of 1.4 cases for the entire group. The high risk experiments all involved iodine 131.

- Consent: for 19 of the 21 studies nothing was known about whether permission of parents was sought or what the parents were told.

Fernald School Study (Nutritional Research)

- Date: late 1940s and early 1950s.
- Experiments:
  * 17 subjects were exposed to radioactive iron (1946)
  * 57 subjects were exposed to radioactive calcium (1950-1953)

  The Massachusetts Task Force concluded the experiments were in violation of the fundamental human rights of the subjects.
- Subjects: young male residents of Fernald who were members of the school's "science club"
- Consent: parents were asked permission to have their children involved, but the information given was, at best, incomplete. Some letters found mention no risks, and stated that the children would receive a special diet rich in various cereals, iron, and vitamins.
- Resulting harm: low doses used and unlikely that any of the children who were used were harmed as a consequence.

Vanderbilt Study (radioactive iron)

- Date: 1940s
- Purpose: to determine the nutritional requirements for iron during pregnancy.
- Subjects: approximately 820 poor, pregnant Caucasian women (administered tracer doses of radioactive iron).
- Consent: apparently no consent was obtained nor was information of the nature of the experiment were given
- Expected risk/benefits: no prospect of medical benefit to the pregnant women or their offspring.
- Resulting harm: a study showed no significant difference in malignancy rates between exposed and nonexposed mothers, but the exposed offspring do show a higher number of malignancies.

TO: Elizabeth and Diane
FROM:: Kirsten
DATE: 7/11/96
RE: TBI Write-up

TOTAL-BODY IRRADIATION: EXPERIMENTS AND TREATMENT

In General

- Dates: 1950-early 1970s
- Purpose: twofold -- TBI was itself recommended as a treatment for patients with incurable cancers, although expectations of benefits were low. Yet, the government's interest in TBI research was not in the treatment of cancer, but rather in the light it would shed on problems the military was facing with atomic weapons and nuclear-powered aircraft.
- Expected risks: TBI can cause acute health effects during the first 6 weeks following an acute (single) exposure. (Table of effects on p. 371).
- Funding: 8 of the 9 institutions that conducted the studies received funding from either the Manhattan Project or the DOD. AEC sponsored one study at Oak Ridge.

University of Cincinnati College of Medicine

- Subjects: 88 cancer patients (most had radioresistant cancers). While all had advanced cancers, many were in reasonably good clinical condition until they received the TBI. All but 5 were referred to the study from either the wards of the Cincinnati General Hospital or its Out-Patient Tumor Clinic. The other 5 were private patients. 51 patients were African American and most were indigent. This distribution reflects the patient population of the hospital. Is some question as to the competence of the patients.
- Purpose: to determine whether amino acids or other biochemicals in the urine could serve as an indicator of biological response of humans to irradiation; to obtain new information about the metabolic effects of total body and partial body irradiation so as to have a better understanding of the acute and subacute effects of irradiation; to provide knowledge of combat effectiveness of troops and to develop additional methods of diagnosis, prognosis, prophylaxis and treatment of these injuries.
- Experiment: psychological and psychiatric testing in addition to TBI.
- Expected risks: mid-way through the project, Cincinnati doctors acknowledged that the TBI treatments posed a risk of death.
- Resulting harm: contemporaneous reports state that TBI treatments may have contributed to the deaths of at least 8 and as many as 20 patients. (Detailed discussion of various reports on this topic on pp 392-395).
- Consent: no mention was made to patients of possible acute effects, such as nausea and vomiting. In the later years of the program, written consent forms were used, but have been criticized for not outlining all the risks. Different forms were used at different times. On some forms information, such as risk of nausea and possible death from bone marrow suppression, was not included. In 1968, a

two-day consent process was initiated, which appears to have been above the standard practice at that time.

University of California Hospital in San Francisco

- Date: 1942-1946
- Purpose: to study the effects of TBI with x-rays of varying energy on hematologically normal individuals.
- Subjects: 29 patients, many of whom had rheumatoid arthritis.
- Consent: no signed consent, although are statements that the patients were informed about the treatments (although not that the Manhattan District was interested in the effects).

Memorial Hospital in New York

- Date: December 1942-August 1944
- Purpose: to yield some detectable effects on the blood count and to serve as a guide to the clinical tolerance for whole-body irradiation; purpose was for the benefit of the military.
- Subjects: 8 patients with metastatic cancer. Selection depended on the cancer being so serious that no other treatment was suitable yet the person still strong enough to withstand the treatment.

Chicago Tumor Clinic

- Date: March 1943-November 1944
- Subjects: 14 people, none of whom had radiosensitive cancers, although some did have illnesses.

M.D. Anderson Hospital (Houston, TX)

- Dates: 1951-1956
- Subjects: 263 cancer patients. Three groups were used: a) patients whose cancers were in such a state that cure or at least definite palliation could still be expected from established methods of treatment; b) patients whose cancers had progressed such that significant benefit from other treatments could not be expected; c) 30 patients who had radioresistant carcinomas for which cures by conventional methods was hopeless. These groups were given doses ranging from 15 R - 200 R. Were also given mental and psychomotor tests. Very little information on subject selection, but many appear to have been indigent members of minorities.
- Consent: beginning in 1953 patients signed forms allowing doctors to administer treatment, but did not disclose any information on risks and benefits.

Baylor University College of Medicine

- Dates: 1954-1963
- Purpose: to get biological dosimeter and data on the acute effects of radiation.
- Subjects: 112 patients (54 had radioresistant cancers).
- Consent: no information/record.

Memorial Sloan-Kettering Institute for Cancer Research (New York)

- Dates: 1954-1961
- Purpose: to find a biological dosimeter and better understand the effects of radiation.
- Subjects: 20 patients with radioresistant and radiosensitive cancers but in relatively good condition.

Naval Hospital in Bethesda, Maryland

- Dates: 1959-1960 (although began treating patients with TBI in 1957)
- Subjects: 17 patients with radioresistant and radiosensitive disorders.
- Consent: authorization forms for TBI treatment were signed but unclear what they were told.

Oak Ridge Institute of Nuclear Studies (ORINS)

- Date: 1957-1974
- Subjects: 194 patients with radiosensitive cancers.
- Consent: admittance agreements and experimental consent forms were signed, indicating that the treatments were experimental and part of a research study. The forms did not mention risk of death or side effects such as vomiting.

TO: **Elizabeth and Diane**
FROM: **Kirsten**
DATE: **6/17/96**
RE: **Atomic Veterans Write-up**

ATOMIC VETERANS

In General

- Dates: January 1951-1963 (when test ban treaty went into effect)
- Purpose: to gather information in the performance of new bomb designs and in the effects of the weapons.
- Tests conducted: over 200 atmospheric tests and dozens of underground tests.
- Subjects: more than 200,000, including soldiers, sailors, air crews, and civilian test personnel, were engaged to staff the tests, to participate as trainees or observers and to gather data on the effects of the weapons.
- Expected risks/Resulting Harm: records indicate that of the 200,000+ participants, about 1,200 received more than today's occupational exposure limit of 5 rem, and the average exposure was below 1 rem; but there was no certainty that lower exposures were risk free. As to long-term risks, pp. 479-482 details studies performed on this topic.
- Only 2 of the 6 experiments were treated as instances of human research at the time.

HumRRO Experiments

Desert Rock I

- Date: November 1951
- Purpose: to train and indoctrinate troops in the fighting of atomic wars; exercise also provided opportunity for psychological and physiological testing of the effects of the experience on the troops.
- Subjects: 5,000 men present; 600 studied by psychologists by HumRRO.
- Experiment Method: 2 groups (control and experimental) participated in the bomb blast; the groups had seen films and heard lectures to "indoctrinate" them about the effects of bomb and radiation safety. Experimental group was given a further non-technical briefing indicating that there was no danger of immediate radiation 90 seconds after an air burst and that they would be safe without shelter. Both groups were administered questionnaires before and after the blast. Physiological measurements, including blood pressure and heart rates were taken after the blast.
- Consent: unknowable since in military people generally do what they are asked to do; subjects were apparently not volunteers. Dr. Crawford believes risks were disclosed.

Desert Rock IV

- Date: May 25, 1952
- Purpose: to train and indoctrinate troops in the fighting of atomic wars;

exercise also provided opportunity for psychological and physiological testing of the effects of the experience on the troops.

- Subject: 700 soldiers who witnessed the shot, 900 who served in the control group as nonparticipants.
- Experiment method: similar to above, but to add realism, the troops witnessed the shot from four miles from ground zero.
- Consent: unknowable since in military people generally do what they are asked to do; subjects were apparently not volunteers. Dr. Crawford believes risks were disclosed.

Desert Rock V

- Date: April 1953
- Subjects: unknown number of participants.
- Purpose: same as above
- Consent: unknowable since in military people generally do what they are asked to do; subjects were apparently not volunteers. Dr. Crawford believes risks were disclosed.

Operation Plumbbob

- Date: 1957
- No formal report on this test.

Atomic Effects Experiments

- Dates: done simultaneously with other tests
- Purpose: to set a standard for developing troop exposure programs and for confirming safety doctrine for tactical use of atomic weapons.
- Subjects: number unknown, but probably less than 100 "volunteers."
- Consent: subjects did apparently "volunteer" and did sign forms saying they were voluntarily undertaking the risk.
- Experiment methods: officers were asked to volunteer for Atomic Effects Experiments and were asked to choose the distance from ground zero they would like to occupy in a foxhole at the time of detonation as long as no closer than 1,500 yards.

Flashblindness Experiments

In general

- Dates: 1951 through 1960s and into the 1970s
- Purpose: to measure thermal effects of the visible light flash (not effects of ionizing radiation).
- Resulting harm: these were the only human experiments where immediate injury was recorded.

At Operation Buster-Jangle

- Date: 1951
- Experiment methods: test subjects were exposed to three detonations, after which changes in their visual acuity were measured.

At Operation Tumbler-Snapper

- Date: 1952
- Subjects: 12 subjects

- Experiment methods: subjects witnessed detonation from a darkened trailer about 16 km from the point of detonation. Each wore a protective hood; one half of the subjects wore protective goggles while the other half had both eyes exposed. A fraction of a second before the explosion, a shutter opened exposing the left eye to the flash.
- Resulting harm: 2 subjects incurred retinal burns.

1953 test by DOD

- 12 subjects in a light-trailer were exposed to 5 nuclear detonation flashes at distances of 7-14 miles.

Research on Protective Clothing

At Operation Jangle

- Date: 1951
- Purpose: to test efficacy of protective clothing.
- Subjects: "volunteer enlisted men."
- Consent: nothing known.
- Experiment methods: 4 hours after the first shot, 8 teams of men walked over contaminated ground for one hour; five days after the second shot, men crawled over contaminated ground.

Other Protective Clothing Experiments

- In 1958 ninety soldiers at Camp Stoneham (Pittsburg, CA) were asked to perform typical army tactical maneuvers on soil contaminated with radioactive lanthanum. Soldiers signed "written statements of voluntary participation."

Cloud-Penetration Experiments

At Operation Teapot

- Date: 1955
- Purpose: to learn how much radiation penetrates into the human system when humans fly through a mushroom cloud.
- Subjects: small number of pilots, perhaps a dozen.
- Consent: no consent forms signed. Waivers to dose limits were sought and approved under the process followed for nonexperimental flythrough activities. Non-scientists were briefed and informed that the risks from radiation exposure would be minimal.
- Experiment methods: pilots swallowed film prior to flying into a mushroom cloud; at the end of the mission, the film was retrieved to compare exposures inside the body and out. The test exposure limit of 3.9 roentgens was waived and 4 officers were permitted to receive up to 15 roentgens.

At Operation Redwing

- Date: 1956
- Purpose: in part to measure the hazard from inhaling or ingesting radioactive particles when flying through a mushroom cloud.
- Subjects: about a dozen pilots.
- Consent: no consent forms signed. Waivers to dose limits were sought and

approved under the process followed for nonexperimental flythrough activities. Non-scientists were briefed and informed that the risks from radiation exposure would be minimal.

- Experiment Methods: pilots flew aircraft without filtering systems through the cloud.

Decontamination Experiments (at Teapot and Operation Plumbbob)

- Dates: 1955 (Teapot); 1957 (Plumbbob)
- Purpose: to determine how soon a contaminated aircraft could be used again
- Subjects: personnel. Nothing else known since this was probably not considered an experiment by the Air Force.
- Consent: nothing known.
- Experiment Methods: among other things, personnel rubbed their hands over contaminated parts of the aircraft and a radioautograph of the hand surface was made.