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Progress Report to the Joint Committee on Atomic Energy

DECEMBER 1951 THROUGH MAY 1952 (U)

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BY MEMO [redacted]

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UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D. C.

JUNE 16, 1952

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PART VI

BIOLOGY AND MEDICINE

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The principal objective of the biology and medicine program in recent months has been the further evaluation of data obtained in connection with atomic weapons tests. The report of the biomedical studies conducted at Operation GREENHOUSE has been completed. Significant data have been obtained from the nation-wide monitoring program for measuring radioactive fall-out from atomic detonations in Nevada. Research and civil defense activities have continued at a somewhat accelerated pace. (End of [REDACTED] section.)

Weapon Test Activities [REDACTED]

GREENHOUSE report. Analysis of the results of the biomedical experiments conducted at Operation GREENHOUSE in the spring of 1951 has led to several important conclusions:

1. Completely analogous injuries are produced in animals when they are exposed to single doses of whole body radiation from a nuclear weapon and from high voltage X rays in the laboratory. These injuries are in turn similar to those sustained by victims of the Hiroshima and Nagasaki detonations.
2. The contribution of neutrons to the total dose was measured by using animals and plants as biological dosimeters. At distances at which gamma radiation was still a significant biomedical hazard, the effect of neutrons was found to be not significant. The neutron flux is variable and will depend on the assembly of the weapon.
3. Intense thermal sources have been used recently in the laboratory to reproduce in animals the anatomical and histological features of flash burns observed at Hiroshima and Nagasaki. To determine how accurately the burns from an atomic weapon can be reproduced in this manner, animals at GREENHOUSE were placed at distances up to about 5,600 yards from ground zero. Burning commenced about 20 to 30 milliseconds after detonation, approximately the same interval which was believed to have elapsed in the Japanese detonations. All thermal injury occurred in less than one second. It was also shown that ultra-violet light from the bomb did not contribute significantly to the thermal injury. The experiment confirmed the validity of the laboratory methods, with all their advantages of convenience, economy, and control.
4. Foxholes afford reasonable emergency shelter against blast and radiation, depending upon yield and distance from ground zero.
5. For occupants of aircraft passing through the stem of an atomic cloud, gamma radiation from external sources is a greater hazard than radiation from inhaled bomb debris.
6. The use of plants, such as Tradescantia, as biological dosimeters may be feasible. The number of breaks in the chromosomes of Tradescantia exposed to bomb radiation correlated very highly with dosages for X and gamma rays, and for neutron dosage when gamma radiation was screened out. Plants may thus provide another means of measuring radiation, comparable to film badges or instruments.

Analysis of radioactive soil. At the Nevada Proving Ground underground explosion in November, 1951, large amounts of radioactive soil fell in the immediate area down wind from ground zero. At a distance of four miles, this fall-out amounted to about 63 tons per square mile. External radiation produced in this way may be an effective method of radiological warfare when coupled with bombing activities.

The relative biological danger from fall-out radioactivity is under investigation. Plants growing in the soil taken from the test site were found to rapidly take up radioactive strontium, one of the fission products. The radioactive strontium would be deposited in the skeletons of animals eating these plants.

Nation-wide monitoring program. The nation-wide monitoring program described in the preceding report was continued during the spring tests at the Nevada Proving Ground. During these tests a network of about 100 stations was utilized in cooperation with the United States Weather Bureau. Of these stations, six were operated in foreign countries by weather detachments from the United States Air Force. Seventy-five stations of the total fixed network collected samples of settled dust, 29 collected filtered dust, and 22 collected both. In the western half of the country the monitoring was accomplished by two aircraft furnished by the Air Force and by eight mobile teams of two men each.

Fall-out studies. Dust and fall-out were measured within the 10- to 50-mile radius of ground zero for three of the tower detonations in the spring tests at the Nevada Proving Grounds. The objectives of the program are:

1. To measure the radioactivity per cubic meter in air for 24 hours following a detonation;
2. To determine approximate size distribution of particles in the air;
3. To chart the pattern of fall-out within this area by the use of gummed paper at approximately 100 collecting points; and
4. To obtain an outline and measurement of radioactivity of particularly hot areas by means of survey teams.

Project GABRIEL. The General Advisory Committee has recommended additional studies of the long- and short-range hazards associated with the detonation of a large number of atomic air bursts. A study by the Rand Corporation has already begun, and another independent investigation is planned. The findings will supplement a preliminary study made in 1949 and more recently brought up to date in relation to the expansion program. (End of ~~SECRET SECURITY INFORMATION~~ section.)

Biomedical Test Planning and Screening Committee ~~SECRET SECURITY INFORMATION~~

A Biomedical Test Planning and Screening Committee, and a companion Committee on Structures, have been formed for the purpose of coordinating requirements of civilian agencies in biomedical and structures experiments at atomic bomb tests. The committees presently are composed of representatives from the Department of Agriculture, Public Health Service, Federal Civil Defense Administration, General Services Administration, Department of Defense, Division of Biological Sciences of the University of Chicago, Los Alamos Scientific Laboratory, New York Operations Office, and the Washington AEC Divisions of Military Application, Construction and Supply, Reactor Development, and Biology and Medicine.

The committees' activities have had three significant results:

1. Certain field experiments have been avoided by the investigation of the feasibility of scale-model HE tests, shock tube tests, and other laboratory testing procedures, resulting in lower costs and more efficient use of personnel.

2. Experiments have been deferred, when possible, for coordination with the testing program schedule to permit more economical and orderly planning.

3. Duplication and overlapping requirements have been avoided and consolidated plans developed.

Research Activities

Radiological use of high energy deuterons. The physical properties and isodose curves of 190 Mev deuterons have been studied by the Radiation Laboratory at the University of California. The study showed that the deuteron beam has unique radiological properties: straight and deep penetration in tissue; small scattering; and maximum dose near the end of the range of the beam. The deuteron beam appears to be suitable for intense irradiation of small volumes deep within the human or animal body. Measurements have been made of the range of the ion beam, the ionization in tissue, and stopping power of tissue. The significance of these studies lies in their possible application to radiotherapy.

Radiation cataract studies. As has been previously reported, radiation cataracts were found in some of the Japanese survivors of the atomic bomb detonations at Hiroshima and Nagasaki. The first re-examination of these Japanese, completed 16 months subsequent to the original study, has revealed interesting information. Fifty per cent of the cataracts had progressed from 1 to 2 grades in a scale of 4 grades; 20 per cent showed regression of about the same degree as those which had progressed; and 30 per cent showed no change. The results suggest that a radiation cataract does not necessarily progress to an advanced state requiring surgery.

Low-level portable cobalt irradiator. A pilot-model, semiportable cobalt irradiator has been developed by the Brookhaven National Laboratory. The Worcester Foundation for Experimental Biology plans to use the instrument for investigating the effects of radiation on the production of adrenal cortical hormones.

The cobalt irradiator, designed to accommodate a source of moderate intensity up to 250 curies of cobalt 60, will fill the need for relatively inexpensive flexible sources of highly penetrating gamma radiation in the experimental radiobiology program. (End of [redacted] section.)

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Trinity Site, Alamogordo, New Mexico

Governor Mechem of New Mexico recently protested the Commission's plan for disposal of trinitite at the Trinity Site, scene of the first atomic bomb detonation. The potential health hazard arising from the decay of trinitite and the medical-legal problem were discussed with the Governor. Commission representatives expressed no objection to preserving all historical features of the site, provided the potential health hazard is removed. Until a final agreement is reached with the State of New Mexico, plans to surface the area have been postponed. (End of U [REDACTED] section.)

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