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Progress Report to the Joint Committee on Atomic Energy

JUNE THROUGH NOVEMBER 1950 (U)

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UNITED STATES ATOMIC ENERGY COMMISSION

WASHINGTON, D. C.

DECEMBER 15, 1950

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6. Biology and Medicine. Technical assistance to the National Security Resources Board in the civil defense program continued to be an important concern. Additional research and development projects relating to radiation tolerance levels, treatment of radiation injury, and radiation instruments were undertaken which will contribute to civil defense planning, as well as to the Commission's program of biology and medicine.

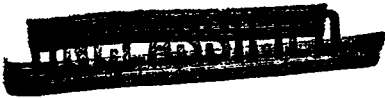
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PART III

WEAPONS

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(This part of the Progress Report is transmitted as a separate document.)

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PART VI

BIOLOGY AND MEDICINE

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The Commission's program of biology and medicine during the next year or more will be concerned principally with:

1. Civil-defense liaison activities, including further development of radiation-detection instruments.
2. Continued studies to establish permissible levels of exposure and methods of radioactive waste disposal.
3. Continued studies of radiation injury and long-term effects of radiation, including the work of the Atomic Bomb Casualty Commission.
4. Training health physicists in radiation protection.
5. Studying the toxicity and metabolism of carbon 14, tritium, and neutrons.

Civil-Defense Liaison

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Interim civil-defense plans for key areas. Representatives of the AEC, as members of the National Security Resources Board Interdepartmental Working Group, participated in three test exercises held in Washington, D. C. (June), Seattle, Washington (July), and Chicago, Illinois (September). Through collaboration of the municipal authorities and the NSRB and its Working Group, plans were formulated by municipal departments and agencies to cope with various aspects of a wartime disaster. A hypothetical attack problem involving atomic explosions was assumed and plans were adapted to the conditions. In each city a week-long series of meetings was held, during which the original plans and solutions based on the hypothetical problems were criticized. Observers of other state, local, and foreign civil-defense bodies also attended.

Civil-defense instructor training courses. During the summer the fourth and fifth radiological monitoring courses, sponsored jointly by the NSRB and AEC, were given by Reed College, Portland, Oregon, and the Illinois Institute of Technology, Chicago. A total of 81 individuals has been trained thus far in these and the three preceding courses at Oak Ridge National Laboratory, Brookhaven National Laboratory, and the Atomic Energy Project, University of California, Los Angeles.

Emergency radiation monitoring program. In September representatives of the five Operations Offices responsible for operation of the emergency monitoring program met and agreed to the allocation of territory by areas, policy for working relationships with local governmental

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agencies, standardization of communications equipment, permissible contamination limits for food and water, permissible doses for personnel on an emergency basis, loan of instruments to states or cities for training, and several administrative matters.

Detailed maps of all cities in the United States of over 50,000 population have been secured in order to aid the 18 AEC emergency monitoring teams. Five representatives of the AEC were designated to serve on the NSRB Advisory Committee on Radiological Monitoring, to study the problems connected with the national program for radiological defense.

Technical assistance to NSRB. The AEC report on "The Effects of Atomic Weapons," published in August, 1950, was furnished the NSRB in draft form, and carried the endorsement of the Director, Civilian Mobilization Office, National Security Resources Board. The pamphlet, "Medical Aspects of Atomic Weapons," first published by the NSRB in January, 1950, from data furnished by the AEC, was revised by the AEC in August. NSRB Document 128, "Survival Under Atomic Attack," was reviewed by the AEC prior to publication in October, 1950. NSRB Document 130, "Fire Aspects of Bombing Attacks," has received AEC review, and the report is scheduled for early release.

At the request of the NSRB, a one-week course in "Nursing Aspects of Atomic Warfare" was given in November, 1950, at the Atomic Energy Project, University of Rochester. Seventy nurses attended. This is one of six similar courses, the other five being given under sponsorship of the United States Public Health Service at various locations throughout the country.

Loan of radiation-detection instruments. The AEC has made arrangements to lend instruments and radiation sources, at the request and upon the approval of the National Security Resources Board, to states or localities for radiological monitoring training purposes, where such instruments can be spared from regular AEC activities. Loans to Ohio, South Dakota, and Oregon have been made thus far through the appropriate field offices of the AEC.

Radiation Instruments

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The AEC's program aims to improve radiation instruments and to assure reliable sources of supply for instruments which are required in the AEC, by users of isotopes, and for civil-defense purposes. For 3 years the AEC has been procuring newly developed radiation instruments and distributing them to AEC laboratories for testing and appraisal. This has been done in order to assist the industry in improving its products, in meeting AEC requirements, and in keeping AEC laboratories cognizant of the industry's latest developments. As part of this program, the AEC in July, 1950, negotiated a contract with the Research Laboratories of the Radio Corporation of America to develop special types of vacuum tubes required by AEC laboratories and plants.

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The AEC in September published its 1950 Radiation Instruments Catalog, which covers Geiger counters, ionization chambers, scintillation counters, dosimeters, film badges, etc. The catalog shows that 84 United States companies are manufacturing 180 types of radiation-detection instruments, including components and accessories. This is an increase of 17 over the number engaged in this work in 1949 and an increase of 78 in the available types of instruments. In all, the catalog lists 543 specific items of equipment now commercially available in the United States.

Biophysics

Survey of the Reactor Testing Station. During the spring the AEC initiated a radiation background study and ecological survey of the Reactor Testing Station. The field work for the survey was recently completed, and a report of the technical findings is being written at Hanford. Preliminary results indicate that the general level of background radiation in Idaho is in the same order of magnitude as the level around Hanford. Because iodine may become one of the major radioactive contaminants, its occurrence has received particular emphasis. These detailed observations will be used to check possible contamination of the area, particularly grazing lands, when reactor operations begin next spring.

Emergency levels of radiation tolerance. A study by the Washington staff was completed in November to determine the levels of radioactivity due to fission products which might be tolerated for emergency periods in food and drinking water. Permissible exposure limits were established, first, for AEC emergency monitoring team members who would be expected to receive exposure in the course of regular duties and, secondly, for non-AEC personnel not receiving exposure in the normal course of work. Studies also are under way at the University of Rochester to determine a simple means which field monitors can use to test suspected water with ordinary instruments to determine whether the water is safe for drinking.

Permissible levels of chronic exposure. In November the AEC also established permissible levels of external radiation under conditions of chronic exposure. In addition, values for permissible concentrations of ten different radioactive isotopes in drinking water, in air, and fixed in the body, have been established. These values, based on the Chalk River, Harwell, and AEC conferences last summer (see Appendix A), are stated for radium, plutonium, natural uranium, U 235, and seven other isotopes. Less firm values, based on less adequate experimental evidence, but tentatively agreed upon at the Chalk River Conference, have been established for guidance purposes for eight other radioactive isotopes.

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Biology

Radiation genetics. The AEC is supporting a large genetics program to determine the mechanism whereby radiation produces genetic changes

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and to establish the genetic risks to human populations resulting from widespread utilization of atomic energy. The influence of oxygen concentration upon the frequency of genetic changes provides a promising lead in this field. The relation of oxygen to frequency of chromosomal changes in plants, to radiation-induced mutations in fruit flies, and to killing bacteria by radiation has been under study at the Oak Ridge National Laboratory and by several investigators in universities supported by AEC research contracts. (See the list of research proposals approved in Appendix E.)

Mammalian genetics. In the mammalian genetics program at the Oak Ridge National Laboratory the rather high frequency of partial sterility in mice, believed to be due to induced chromosomal changes after radiation, was confirmed. From preliminary findings it appears that the frequency of partial sterility in mice is higher than might be expected for a given dosage, based on chromosomes in plants and fruit flies. The greater number of chromosomes per cell may be partially responsible (8 for fruit flies, 40 for mice, 48 for man). This pilot experiment will be useful in determining the feasibility of a proposed large-scale study of radiation-induced mutation of specific genes.

Agriculture. For nearly 2 years the AEC and the Bureau of Plant Industry of the Department of Agriculture have jointly participated in a project of research and development in the safe and extensive use of radioisotopes. The AEC has supported basic phases of the program, including facilities for producing different tagged fertilizers, while the Department of Agriculture has directed the field experimental stations. In the spring of 1950 radioactive materials for research on soils, fertilizers, and plant nutrition were shipped from the Agricultural Research Center, Beltsville, Maryland, to 22 State Agricultural Experiment Stations for 67 different studies during the growing year. In July the greenhouse and laboratory facilities for radioactive fertilizer preparation experiments were completed at the Center, and experiments there have shown how widely different crops vary in their ability to use phosphorous and other fertilizer material from the soil. Investigations at the Center last summer indicated that plants become yellow and stunted during growth primarily because of deficiencies in certain trace elements (iron, zinc, and manganese).

Medicine

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Plutonium and radon inhalation. Last spring the University of Rochester was authorized to establish a research project on plutonium and radon inhalation. Results from this program are expected to permit sounder understanding of human tolerance toward radioactive isotopes. In order to obtain additional information on the potential danger of inhaled radioactivity, studies on this problem involving fission products and other radioactive emitters of particular importance to the weapons program were also initiated in October at the Atomic Energy Project, University of Rochester.

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Therapy of radiation injury. Studies of the treatment and amelioration of the illness resulting from exposure to near lethal doses of radiation have been intensified with the hope of being useful in treating human casualties. To this end a large-scale therapy program on dogs was initiated this fall at the Atomic Energy Project, University of Rochester, to provide within a one-year period, definitive recommendations for the treatment of human atomic casualties.

Blood fractionation program. As a result of AEC participation in the blood fractionation program of the American Red Cross being conducted at Harvard University, it has recently been found possible to separate viable white blood cells and blood platelets from the blood being processed at the Red Cross Blood Centers: The original program called for the separation of plasma for stockpiling purposes and experimentation on the preservation of red blood cells. AEC participation in the work permitted an intensification of activities directed toward the separation of white blood cells and platelets, which would be important in treating massive infections and hemorrhages following exposure to large doses of atomic radiation. (End of [REDACTED] section.)

Atomic Bomb Casualty Commission. ([REDACTED]) An ophthalmological survey of all the survivors of the Japanese bombings who were still residing in Hiroshima and Nagasaki and who had been within 1,000 meters of the center was completed during the summer. Radiation cataracts were found in 75 cases among 1,266 such survivors in Hiroshima, and 25 cases were found among a similar group of 500 persons at Nagasaki.

Under the genetics program, the examination of all children born in Hiroshima and Nagasaki is continuing. Kurie has been eliminated as a "control" city, and parts of the populations at Hiroshima and Nagasaki are being used instead. Analysis of the data secured in 1949 has revealed no significant difference in the number of abnormalities of the offspring of exposed parents, compared with the nonexposed group. The 41,860 examinations performed thus far are still insufficient for detection of the small differences which might be expected. The new Hijiyama Laboratory at Hiroshima is virtually complete and should be in operation before the end of 1950. This will permit the examination of survivors to proceed at a greatly increased rate. (End of section for [REDACTED] ONLY.)

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Weapons Tests [REDACTED]

Preparations for the biological and medical studies to be carried out at Eniwetok in 1951 are under way. Breeding colonies for the three animal species to be used (pigs, dogs, and mice) have been established on the test islands to produce animals which are acclimated to the environment. Containers for housing the animals during the tests are being constructed and will shortly be shipped to the test islands. Some experimental animals that survive the test will be returned for study of long-term effects of radiation.

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Radiological Warfare (RW)

The extent to which potential radiological warfare materials, such as protactinium 233, zirconium 95, columbium 95, lanthanum, and other materials, are taken up by the edible tissue of cattle, pigs, and sheep, and into milk and eggs is being studied under a new project recently authorized at the University of Tennessee. The experiment is designed to provide information on the extent of the hazard to populations from RW materials that might be scattered over supplies of feed for livestock and poultry. (End of [REDACTED] section.)

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Construction ([REDACTED])

Oak Ridge Cancer Hospital. The Oak Ridge Cancer Hospital was completed, and the first patients were admitted for treatment in April, 1950. The hospital is a 30-bed unit devoted exclusively to the experimental treatment of selected cancer patients with the short-lived radioisotopes available from the Oak Ridge pile. Patients are selected and referred to the hospital by the medical schools and physicians of the southern states.

Argonne Cancer Hospital. Construction was initiated on the Argonne Cancer Hospital in June and is scheduled for completion in October, 1951. This experimental therapy and research unit will provide care for 40 cancer patients and cost approximately \$4,275,000. As in the Oak Ridge Cancer Unit, the emphasis will be on the experimental treatment of cancer in selected patients, making use of the short-lived isotopes and facilities provided by the Argonne National Laboratory. (End of [REDACTED] section.)

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