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QUARTERLY PROGRESS REPORT (U)

to the JOINT COMMITTEE on ATOMIC ENERGY

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July - September 1958

UNITED STATES ATOMIC ENERGY COMMISSION

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CHEMISTRY RESEARCH

Project MICE ([redacted])

Studies continued on the feasibility of producing plutonium, tritium, and uranium 233 from a confined nuclear explosion. The scope of this project has not changed since reported in the July-September 1956 Quarterly Progress Report. The project continues to entail the investigation of the economics involved in the production and recovery of special nuclear materials following a completely confined underground explosion under appropriate conditions of a thermonuclear device enclosed in a blanket of fertile material.

The U. S. Geological Survey is studying the geological aspects, and the chemical and engineering problems are being investigated by the Oak Ridge National Laboratory and the U. S. Naval Radiological Defense Laboratory. These studies are closely coordinated with related activities in underground testing of nuclear weapons and the PLOWSHARE program. Two crucial problems under investigation include the determination of the extent to which the special nuclear materials are mixed in the surrounding matrix, and the possibility of recovering gaseous products, particularly tritium, by prompt venting of the detonated area. These problems are being investigated in connection with (1) the results of the Rainier shot, which was detonated in September 1957 and was the first wholly contained underground nuclear shot, (2) Phase II of Operation HARDTACK, and (3) the Gnome event, the underground detonation in a salt formation scheduled for the summer of 1959 as a part of the PLOWSHARE program. Information obtained from these studies will be used in conjunction with a recently completed feasibility study, to determine the future scope and direction of the MICE project. (Project PLOWSHARE is discussed on page 41.) (End of [redacted]ection.)

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Part VIII

Biology and Medicine

RADIOBIOLOGICAL SURVEYS IN THE PACIFIC ([redacted])

Preliminary results of some of the radiobiological surveys conducted in the Pacific during the July-September quarter are given below. These surveys, some of which were still in progress at the end of the quarter, were undertaken to monitor the radioactivity in the water and in marine organisms, resulting from Operation HARDTACK. The surveys were described in detail in the Quarterly Progress Report, April–June 1958.

Fallout During Operation HARDTACK

Highly radioactive fallout was limited to the announced danger area. Radiation doses to members of the Joint Task Force were kept to a minimum, and there were no serious radiation situations.

Marine Radiobiological Surveys

A radiobiological survey of the danger area conducted August 9–15 indicated that the restricted area could be disestablished without hazard. A similar survey was conducted September 3–12 in the area between Eniwetok and Guam, covering most of the western half of the restricted area and extending a considerable distance beyond its western boundary. Sea water and plankton samples indicated that the radioactivity levels were of the same order of magnitude as those found in the post-REDWING survey in 1956. Further evaluation of the results was being made.

Tuna Sampling

By the end of September samples of tuna from about 100 locations in the western and central Pacific and 2 locations in the Indian Ocean had been sent to the Laboratory of Radiation Biology of the University of Washington for gross beta and gamma counts and analysis. Most of the tuna was caught in the area north of the equator, south of Japan, west of the Eniwetok test site, and east of the Philippines. Counting of these samples revealed little radioactivity, most of which could be accounted for by the naturally occurring radioisotope potassium 40. However, at a later time and in limited areas, some tuna may acquire some radioactivity produced by the HARDTACK test, probably by way of the food chain.

SOIL SAMPLING AROUND THE NEVADA TEST SITE

Following Operation PLUMBBOB (1957) soil samples were collected for analysis for strontium 90 from areas around the Nevada Test Site (NTS) receiving some of the heaviest

[redacted]

fallout from tests at NTS. Results of analyses completed by the end of the quarter are given below. These values are substantially lower than values for these areas derived from theoretical calculations. The difference between the actual and expected strontium 90 content may result from such factors as weathering and low rainfall in these areas and from the fact that strontium 90 tends to form a smaller percentage of nearby fallout than predicted from tables of theoretical composition of mixed fission products.

Location	Strontium 90 (millicuries per square mile)
Tempiute, Nevada	42.3
Cedar City, Utah	36.2
Lund, Nevada	30.7
Beaver, Utah	29.6
Eureka, Nevada	25.6
St. George, Utah	24.1
Alamo, Nevada	15.3
Bishop, California	14.9
Caliente, Nevada	14.6
Overton, Nevada	9.7
Mesquite, Nevada	5.2
Barstow, California	1.96

For comparison, values for some other locations in the United States are given below. It will be noted that the values for soils collected around NTS are not significantly different from the values for these other locations.

Location	Strontium 90 (millicuries per square mile)
Memphis, Tennessee	38.0
Rapid City, South Dakota	31.7
New Orleans, Louisiana	30.4
Detroit, Michigan	29.9
Rochester, New York	27.9
Seattle, Washington	27.5
Los Angeles, California	8.3

(Values obtained from other locations were all within the range shown above.)

PREPARATION FOR LARGE-SCALE RADIOEPIDEMIOLOGIC STUDIES

About 30 scientists engaged in human radiobiologic studies attended a meeting at AEC headquarters in September to advise on planning for large-scale studies of the effects of low-level environmental radiation on human populations. Effort was made to design investigative procedures for measuring general fitness and the effects that environmental radiation may have on fitness. Particular attention was given to leukemia induced by radiation and to the effects of radiation at different altitudes. The first part of the meeting was devoted to review of the status of studies dealing with "ready-made" human radiobiologic situations, such as those at Hiroshima and the Marshall Islands and those presented by accident cases, radium

dial painters, miners of radioactive ores, therapy cases, and people who live in radioactive regions or drink water that is radioactive. The second part of the meeting was devoted to discussion of investigative procedures for more comprehensive studies. It was felt that the studies already under way were valuable and should be continued. It was recognized, however, that the undertaking of more comprehensive studies would present many difficulties and that meaningful scientific information might not be derived from them.

AERIAL RADIATION SURVEYS

During the July-September quarter the U. S. Geological Survey conducted aerial radiation surveys in the southwestern corner of Utah and adjoining territory in Nevada and Arizona to obtain data for use in a study concerned with external gamma radiation levels in and around certain communities. In addition firm plans were developed to extend the aerial monitoring program conducted in connection with fall 1958 weapons test activities at the Nevada Test Site to include surveys of Mare Island, Livermore, and Berkeley reactor locations on the West Coast, and Brookhaven and New London on the East Coast.

CIVIL EFFECTS ACTIVITIES

Radiation Surveys—Nevada Test Site Area

Aerial and ground radiation surveys were conducted at NTS in July and August in advance of the experimental phase of the reactor testing activities at Jackass Flats and to provide a followup for fallout studies conducted during Operation PLUMBBOB. Under AEC direction, personnel of the Atomic Energy Project of the University of California at Los Angeles made ground surveys, which included the collection of soil, plant, and animal samples in the Jackass Flats area, and the U. S. Geological Survey conducted airborne surveys. The aerial surveys were completed in early August. The UCLA personnel also conducted a plutonium survey and a strontium and cesium survey in areas contaminated by past tests. (End of [redacted] section.)

Participation in Fall 1958 Weapons Tests [redacted]

In September, and continuing into October, the AEC Civil Effects Test Group and the Office of Civil and Defense Mobilization participated in the weapons tests at NTS. Field work included measurement of fallout by personnel of the UCLA Atomic Energy Project, with aerial radiation monitoring by the U. S. Geological Survey. The air survey capability was made available to the test site radiological safety organization for onsite or offsite emergency assignments. A second project involved the continuation of studies of the angular distribution of prompt bomb radiation in the air and studies of the shielding characteristics of light frame houses against prompt gamma and neutron radiation. This project, as in Operation PLUMBBOB, was being performed by personnel from Oak Ridge National Laboratory. In another project, the effects of nuclear detonations on AEC test structures in regions of high blast pressures and prompt radiation were being studied.

Under an AEC research contract, personnel from Highlands University of Las Vegas, New Mexico, continued botanical field studies initiated during Operation PLUMBBOB. (End of [redacted] section.)

Civil Effects Task Units ([redacted]

A meeting of the AEC Blast Biology Task Unit was held in August at Albuquerque under the chairmanship of Dr. C. S. White of the Lovelace Foundation. The task unit reviewed the

state of knowledge of blast biology, determined the priorities of needs for data, and was to make recommendations as to the field and laboratory experiments required to obtain these data. A similar meeting of the Thermal Biology Task Unit was held in Washington, D. C., in September under the chairmanship of Dr. Herman Pearse of the University of Rochester.

Radiation Monitoring Instruments

Plans were made for the evaluation of two prototype instruments combining a portable transistor radio and a radiation dose rate meter that have been developed for civilian use. Twenty-five instruments of each type will be distributed to AEC laboratories and selected field personnel for test and comment.

EXPANSION OF RESEARCH

A comprehensive analysis and evaluation of the biology and medicine research program was completed during the quarter. This review was conducted in accordance with recommendations made during the 1957 hearings of the Joint Committee on "The Nature of Radioactive Fallout and Its Effects on Man" that the AEC's biomedical program be examined as to possible need for increased research effort in order to accelerate resolution of the problems of the biological hazards of radiation and radioactive fallout. The testimony at the hearings brought out that there was a well balanced AEC-supported research program in biology and medicine and that any proposed increase in research should not be at the expense of long-term basic research by a diversion of effort to a multitude of short-lived programmatic research projects.

As a result of this review the Commission approved, for planning purposes, a 5-year plan for continued expansion of research in biology and medicine, emphasizing particularly the biological hazards of radiation associated with peaceful and military uses of atomic energy.

BERYLLIUM SURVEYS

Because of the health hazards associated with beryllium handling, the Health and Safety Laboratory of the New York Operations Office (HASL) is continually studying beryllium operations and hazards in connection with AEC contractor activities in this field, as a part of its environmental health services and studies.

Surveys of occupational exposure to beryllium dust at the new Beryllium Corporation plant at Hazelton, Pennsylvania, were conducted in January and May 1958. The May survey showed that all production employees were receiving five or more times the maximum acceptable concentration. It was decided to shut down the refinery until major changes in equipment and operations could be made.

A similar survey of the new Brush Beryllium Company refinery at Elmore, Ohio, conducted during the plant shakedown period, showed a large number of the 108 persons studied were being exposed to excessive concentrations of beryllium. HASL made recommendations for improving dust control. It was decided that air concentrations were not sufficiently hazardous to warrant closing the plant, but that extensive plant modifications were needed to ensure satisfactory operations.

In July representatives of HASL and the Chicago Operations Office reviewed decontamination of the AEC beryllium production plant at Luckey, Ohio. Good progress had been made in decontamination since the plant closed down in December 1957, but cleanup probably will not be completed before May 1959. HASL will continue to advise the contractor on decontamination procedures and will help perform periodic tests of certain equipment and buildings which have been decontaminated.

RADIOLOGICAL INCIDENT CENTER

A Radiological Incident Center was established at AEC headquarters in Germantown to coordinate actions required in the event of a radiation incident. The center will be active only in the event of an incident of sufficient magnitude to warrant its utilization to coordinate headquarters responsibilities in such matters as public relations and Congressional notification, and to assist the responsible field office in obtaining help to cope with the incident.

TRAINING AND EDUCATION

Summer Institutes in Radiation Biology

Negotiations were begun for the establishment of training courses in radiation biology for high school science teachers, to be held at 15 to 17 universities in the summer of 1959. Similar summer institutes were held at 12 universities in 1958. These institutes in radiation biology are supported by the AEC in cooperation with the National Science Foundation (NSF) under an arrangement whereby the AEC contracts with the universities offering the courses and the NSF assists the teachers attending the institutes. In its over-all program for summer institutes for 1959 the NSF will support 300 institutes presenting courses in science and mathematics. (End of [redacted] section.)

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