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page 2

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CONTENTS

*Transmitted as a separate document.

pages 4-33

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Part VII

Biology and Medicine

PROJECT SUNSHINE [redacted]

Soil Sampling and Comparison of Collection Methods

Studies involving the monitoring of the distribution of fallout over the surface of the earth have been extended. The analysis of gummed-paper samples from more than 100 stations has been continued, and a larger number of soil samples from about 30 geographical locations outside the United States are being analyzed by the New York Health and Safety Laboratory to determine their radiostrontium content. In addition, the discrepancy between data collected by different techniques is being investigated. Data from gummed-paper samples are being compared to those from collection pots placed at about 20 gummed-paper stations in the United States and abroad. Stations were selected for these comparative studies in a manner which would provide samples from a variety of climates. In the analysis of soil samples, studies are being conducted to establish the reliability of chemical methods for estimating not only the total strontium content but also the amount of strontium 90 available for plant uptake as related to the available calcium content.

Distribution of Radiostrontium in Foodstuffs

More information is being collected from foreign countries for research on the distribution of radiostrontium in foodstuffs. Samples both of foods in the composite diet and of human urine are being collected in Turkey and the Philippines by survey teams of the Interdepartmental Committee on Nutrition for National Defense, in which committee AEC is participating. The samples will be analyzed by the New York Health and Safety Laboratory. Information is also being collected on the foods which provide the major source of calcium, the per capita consumption, and the average calcium content of each foodstuff. These data may help to determine the importance of such factors as geographic location, calcium content of soils, and local dietary habits in the distribution of strontium 90 in foodstuffs.

MOUSE GENETICS

One of the major genetics projects supported by the AEC is the study of radiation-induced mutations in mice. In the United States, the mouse genetics project at Oak Ridge National Laboratory supplies the most important data available on induced mutations in mammals, on which extrapolations to human populations can be based.

The United Kingdom has also been supporting at Harwell a smaller mouse genetics project, which is now being expanded. To ensure that the Harwell and Oak Ridge projects are

complementary and thus produce the maximum amount of data, the British Medical Research Council planned to sponsor a conference at Harwell on April 26, 1957. Three AEC geneticists were selected to attend the conference.

REPATRIATION OF THE RONGELAPESE

The Commission has determined that the degree of contamination on Rongelap Atoll has declined to an acceptable level for the return of the Rongelapese to their home island as soon as rehabilitation procedures have been completed. The Rongelapese, the last of the Marshall Islanders to be returned to their home island, were evacuated from the atoll after the fallout of radioactive fission products from the March 1, 1954, detonation in the Eniwetok Proving Ground.

Medical Examinations

Since their exposure to radioactive fallout in 1954, the Marshallese have received four complete medical examinations. The most recent examination was made in March 1957. Preliminary reports on this examination indicated no illnesses or other clinical conditions which could be related to radiation effects, and the people appeared to be recovering satisfactorily from radiation exposure.

Blood counts. Although statistical analyses of blood examinations had not been completed, it appeared that the blood cell counts were about equal to those in the unexposed people examined.

Skin burns from beta radiation showed continued improvement, and there were new indications that pigment was returning in burn areas. There was no evidence of any malignancy in any of the scars resulting from radiation burns.

Body radioactivity. Because urinalyses made in 1956 showed little remaining body radioactivity, a more sensitive measure of residual activity was used in the 1957 examination. Four persons from Rongelap, two from Utirik, and one unexposed person from Majuro, who served as a control for the experiment, were brought to Argonne National Laboratory, where total body radioactivity was measured in the Human Radiation Detector ("Iron Room"). Detectable amounts of activity were still present, but they were only several times higher than those found in people in other parts of the world and were well below the accepted tolerance levels.

Deaths. The only deaths among the Rongelap people since the 1956 survey were one still-birth and the death of an infant a few hours after birth as a result of infection. These deaths were not believed to be related to radiation effects.

Utirik. About 130 people who had been exposed to slight amounts of fallout on the island of Utirik were also examined. They were found generally to be in good health, with no illnesses or clinical conditions which could be related to radiation effects. Radiation could not be established as a factor in the six deaths which had occurred on Utirik during the three-year period. This death rate was not considered to be unusual.

External Gamma Dose Rates

The radiation survey of Rongelap Island in July 1956 showed gamma values ranging from 0.2 to 0.5 milliroentgen per hour, with an average of 0.4 milliroentgen per hour. Estimates of decay indicated that dose rates at the time of repatriation will be less than 30 milliroentgens per week. It was also estimated that the gamma dose on Rongelap will be about 0.5 roentgen

for the first year of reoccupation and will gradually decline thereafter. The Rongelapese who go on fishing expeditions to other islands could be exposed to levels of radioactivity higher than those of Rongelap; however, much of their time is spent on fishing boats over waters with gamma activity near background values. Thus the external gamma radiation received by the Rongelapese as a whole can be expected to be initially 0.5 roentgen or less per year.

There is no radiation standard which applies directly to the Rongelap situation. However, standards established for normal atomic energy activities involving much larger numbers of people may be of some significance in evaluating the Rongelap data. For occupational conditions, the National Committee on Radiation Protection and Measurement recommends that adult workers not be exposed to more than 0.3 rem (roentgen equivalent for man) of whole body radiation per week, or a 13-week dose of 3 rems when the weekly limit is exceeded. This standard is further restricted by an age qualification, which provides that the maximum permissible accumulated dose in rems, at any age, is equal to five times the number of years beyond age 18, provided no annual increment exceeds 15 rems. Thus, for persons over 18 years of age the accumulated maximum permissible dosage is 5(N-18) rems, where N is the age. This standard applies to all critical organs except the skin, for which the value is double. For a large population, in contrast with the small group of Rongelapese, the maximum permissible exposure is an average of 14 million rems per million persons during the period from conception up to the age of 30, and one-third of that amount in each decade thereafter.

Food Supply and Body Content of Strontium 90

Strontium 90 is the radioactive isotope of principal concern in the food chain of the Marshallese. Analysis of the results from all the Pacific Islands surveyed shows a decline of strontium 90 with the passage of time, except in the land crabs. Additional collections of land crabs will be made on Rongelap to establish the reason for the increase in strontium 90 activity.

Maximum permissible exposure to strontium 90 for the general population, in terms of maintained level in the body, is 100 Sunshine Units (100 micromicrocuries of strontium 90 per gram of calcium). Exposure of the Rongelapese can be reduced by eliminating land crabs from the diet and by reducing the consumption of such native plants as pandanus. Because only a part of the strontium 90 will go from food to bone, these measures may limit the ultimate body burden for the Rongelapese to substantially less than 100 Sunshine Units.

Swine, chickens, ducks, and rats have continued to live on Rongelap during the period of highest strontium 90 contamination in the soil-plant-animal cycle. Examinations of rats collected and sacrificed two years after the initial fallout show no gross or pathological changes that could definitely be ascribed to radiation.

Medical Surveillance

When the Rongelap people are returned to their home island, they will be given regular monthly medical examinations by local health personnel and an annual examination by a physician from the United States. A dispensary will be maintained for regular health services. Any unusual body accumulation of strontium 90 will be detected before harmful effects result.

Biological Surveys

A summary report of the several biological surveys made of the Marshall Islands is being prepared by the AEC staff. The basic studies were made by the University of Washington, the Naval Radiological Defense Laboratory, and the New York Health and Safety Laboratory.

Ecological Studies

Plans have been made for a long-term study of the effects of environmental conditions and processes on plant and animal life on Rongelap Atoll and in adjacent waters. An effort will also be made to determine the relationship between biological systems of the land and the sea. Climatic data will be collected on temperature, rainfall, light intensities, wind, and relative humidity. Indigenous soil factors will be analyzed by mapping of soil and radiation patterns, and aquatic features will be studied in both fresh and salt water. An inventory of plant and animal life will include the determination of species association; mapping of vegetation patterns; plant and animal population studies; study of the production, utilization, exchange, and transfer of mineral and organic materials between the land and sea; sampling of the lagoon bottom; and sampling for radioactivity in selected plants and animals. This study is expected to begin about the time the Rongelap people are returned to their home island.

NEW EDUCATIONAL PROGRAM

By formal agreement with the American Institute of Biological Sciences, AEC has arranged to provide lecturers in biology to small colleges and universities throughout the United States. Forty-one members of AEC staffs at laboratories and other installations have volunteered to lecture and consult with students during three- to five-day visits at nearby institutions. The first visits were made during March, but the program is not expected to be in full operation until the fall semester of 1957. (End of [redacted] section.)

pages 38-48

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