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M. W. Boyer, General Manager

December 19, 1952

John C. Bugher, Director, Division of Biology and Medicine

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MONTHLY STATUS AND PROGRESS REPORT, NOVEMBER 1952 -
DIVISION OF BIOLOGY AND MEDICINE

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Transmitted herewith is the Monthly Status and Progress Report for this Division covering the month of November 1952.

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Report

CC: J. H. Burchard

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ORGANIZATION & MANAGEMENT

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SURNAME ▶	O'Neill Lanier	Brown	Bugher			
DATE ▶	12/19/52	12/22/52	12/22			

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MONTHLY STATUS AND PROGRESS REPORT

DIVISION OF BIOLOGY AND MEDICINE

MONTH OF NOVEMBER, 1952

Weapons Test Activities

Monitoring Program for Operation IVY (SECRET) During recent tests held in the Pacific (IVY series), fifty fixed monitoring stations were set up in the United States and sixty-seven other stations were established throughout the world. In addition, three mobile monitoring teams under the supervision of the New York Operations Office operated out of Kwajelain, Guam, and Honolulu respectively.

Measurements of gamma radiation were made by the mobile monitoring teams from low-flying airplanes. The teams were equipped with a "scintillog"--an instrument developed by the New York Operations Office to obtain the dose rates of radiation. The readings taken were then converted into estimated readings at ground level. Only low level activities were detected throughout the Pacific Islands. Outside the Eniwetok Atoll, the highest reading was approximately 1.5 milliroentgens per hour of gamma radiation at 60 hours after detonation of Mike Shot. This observation was made at Agrihan which is about 1000 miles from Eniwetok Atoll. This would represent an estimated lifetime dose of 450 milliroentgens. The highest gamma readings observed following King Shot were about 1/3 those found after Mike Shot.

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BY AUTHORITY OF DOE/OC
JOSE DIAZ 4-15-81
REVIEWED BY DATE
Wilbur A. STRAUSERS 4-17-87
REVIEWED BY DATE
By: DICK KOOGLE 6-9-87

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Air sampling units were set up on Kusaie, Ponape, Ujeland, Bikini, Majuro and Kwajalein. These samplers were set to start operating automatically when the intensity reached 0.5 milliroentgens per hour. None of the samplers were put into operation as the activity level did not reach even 0.5 milliroentgens per hour at these locations. Some airborne activity was observed at other positions where the stations were manually operated but none of these measurements showed high concentrations.

Several AEC installations made observations of fall-out activity. In the Hanford area, a rise in air activity about 500 times above normal was reported for the periods November 11 and 12, with a sharp drop-off thereafter. Minimum levels were noted across the northern parts of the United States with some diffusion to the southern states a few days later. None of these observed concentrations, however, were of significance in terms of health hazards.

Use of Lead Capes to Reduce Gamma Exposure. ([redacted] During the IVY tests, cloud-sampling operations were performed by pilots in aircraft. These pilots were equipped with lead capes which were worn to reduce gamma radiation. In the early flights, the dose received on the inside of the capes as compared to the outer parts was reduced by a factor of 4. However, in later flights, reduction by a factor of 2 was observed. The highest dose received by these aircraft pilots was 3.7 roentgens which is below the maximum amount of gamma radiation permitted for an external exposure of radiation (3.9 roentgens for a period of 13 weeks).

Standard Film Badges for Personnel Monitoring at Weapons Tests. (UNCLASSIFIED) The Division has recently recommended a standardized film badge and procedures for its use in radiation monitoring of personnel participating in weapons tests. Assistance was obtained from Commission contractors and from other Government agencies in arriving at the type of film to be used, methods of marking, packaging, developing, reading and recording. The National Bureau of Standards provided basic information for shielding and data for evaluating the accuracy of the readings.

The badge recommended consists of a low and high sensitivity film in customary paper wrapper shielded on both sides with a strip of lead 0.72 millimeters in thickness with dented numbering. The badge is enclosed in a thin transparent plastic envelope for protection against dirt and humidity. It is expected that these badges will be employed during forthcoming tests.

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Research Activities

Effects of Low-Level Irradition on Fly Populations. (UNCLASSIFIED) In experiments with fruit flies, it has been found that radiation exposure induced increased frequency of mutations in specific genes, many of which are deleterious. In an attempt to determine whether these changes are injurious or beneficial to whole populations, investigators at Cold Spring Harbor, Long Island, New York, exposed breeding populations of Drosophila flies continuously to dosages of 5 roentgens per day, equivalent to a lifetime total per fly of 300 roentgens. Although mutations increased in frequency the population as a whole remained healthy and even increased in number. The flies even appeared to be healthier than other wild populations not so exposed. It would appear that there is some advantage in low-level irradiation of some of the lower animals despite the increased number of mutations. Apparently, some populations may be expected to have a greater tolerance for low level radiation than studies of the radiogenetic effects on the individual organism have suggested.

Studies of High Dose Radiation in Animals. ([redacted]tudies are being undertaken at Los Alamos Scientific Laboratory on the effects of massive doses of gamma rays on rats, mice, and monkeys. A barium-lanthunum source used for these studies has a total curie strength of 10,000 to 30,000 curies; and dose rates from 2,000 to 10,000 roentgens per minute are possible.

In one experiment, eight monkeys were exposed to doses of gamma rays ranging from 1,000 to 30,000 roentgens, at a dose rate of 1,000 roentgens per minute. The monkeys were tested for five minutes between 1 and 8 hours after exposure for their ability to perform certain learned tasks in which they were trained. All of the animals became ataxic and nauseated at 3-7 minutes from the beginning of the exposure; and eventually, but at different intervals, all refused to perform completely. The data developed indicates that there was no significant change in the relative biological effectiveness of gamma rays as a function of dose rate between 6 to 9,000 roentgens per minute; and that the incapacitating dose of radiation lay between 10,000 to 30,000 roentgens.

These studies are of particular interest to the Air Force both from the offensive and defensive standpoints in knowing doses of radiation

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that will incapacitate men during explosions of atomic projectiles at high altitudes up to 40,000 feet.

Neutron Studies. (UNCLASSIFIED) At Los Alamos Laboratory, the biological effects of thermal neutrons are being studied by exposing rats and mice to a range of doses in a nuclear reactor and comparing the effects with those produced by 250 KVP x-rays. For the comparison several indices are being employed including lethal dose, decrease in weight of the spleen, thymus, and testes, and the uptake of iron by the red blood cells. In the case of each index, neutrons had a biological effectiveness of 1.7 times that of x-radiation. In contrast to these effects, neutrons were about 15 times as effective as 250 KVP x-rays in causing cataracts on the eyes of mice. As the dose of radiation was increased the time required for cataracts to appear became less in much the same manner for both types of radiation. This suggests that x-rays and neutrons may have the same mechanisms of action even though neutrons are more potent in causing cataracts.

Atomic Bomb Casualty Commission. (UNCLASSIFIED) A recent visit to Japan was made by Division members to review the research program of the Atomic Bomb Casualty Commission. An informal agreement has been reached with the Japanese Government whereby sponsorship of the ABCC is assumed by the American Embassy. Thus the ABCC personnel, although not an official part of the Embassy and without diplomatic status, are accorded special privileges normally given to American Embassy organizational units.

Valuable data is being assembled under the ABCC project which may be applicable to the problem of dosimetry. It is generally recognized that past estimates of gamma and neutron dosages are somewhat inaccurate. Experience in bomb tests of the last year demonstrate that biological systems may be more sensitive indicators of integrated radiation dosage than any physical system now available. It therefore has seemed worthwhile to approach the problem of the radiation flux delivered by the two bombs from the standpoint of the biological effects upon exposed individuals. The present plan, therefore, seeks to derive dosage levels in terms of a human biological unit which may be equated with known doses of x-ray of a specified energy. For this purpose, a statistical study is being made of the degree of epilation in individuals exposed without protection - that is, individuals in the open at the time of the detonations. As an index of dosage, it is found that if total epilation is taken as a

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criterion, the percentage of surviving epilated people increases quite rapidly as one moves from the periphery of the exposure field toward the center. Fifty per cent total epilation is therefore being taken as a unit dose, and for some distance both nearer and farther than the 50% point reasonable estimates may be obtained directly upon the basis of the proportion of individuals having exhibited total epilation.

In the general field of neutron exposure, it is quite probable that the observation of lens changes in individuals in the open at the time of detonation may likewise give a sound biological dosimetric basis. By thus establishing the quantitative character of the radiation field, it should then be possible to evaluate the degree of shielding experienced by various categories of people - for example, those in wooden houses, those in concrete buildings, etc. This is one of the difficult aspects of the interpretation of the human data, and an approach along this line would seem to offer a substantial possibility of establishing dosimetry independently of the other data. It is of interest to note, incidently, that several Japanese inhabitants of Hiroshima went to Nagasaki immediately after the bombing and were thus exposed, not only to the first, but to the second bomb. However, it is recognized that further investigations are required of these cases before any conclusions are established.

General

Training Center for Radiological Physicists. (UNCLASSIFIED) The training program to prepare personnel (for special study) in health physics, radiation monitoring and control, radioisotope measurements and hospital physics has been expanded recently. In addition to the training at the University of Rochester and Vanderbilt University (under Brookhaven and Oak Ridge Laboratories, respectively), a third training center will be established in the northwestern section of the United States. The academic courses will be conducted by the Department of Physics at the University of Washington in Seattle, and the Department of Radiological Sciences at Hanford Works (Richland) will handle the field training. Approximately 75 candidates will be selected for study in the field of radiological physics for the coming academic year, with not more than 25 at any one of the field training sites. Administration of the program is under the Oak Ridge Institute of Nuclear Studies.

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