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MONTHLY STATUS AND PROGRESS REPORTS

FOR

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Excerpt

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V - BIOLOGY AND MEDICINE

Weapons Test Activities

Civil effects program--UPSHOT-KNOTHOLE [redacted]. Preoperational plans and arrangements for the civil effects program, which will be a part of forthcoming tests, are being completed on schedule. The group office at Camp Mercury, Nevada Proving Ground, was activated on February 26, 1953, to handle final preparations. Civil effects group personnel participating in Operation UPSHOT-KNOTHOLE totaled 184 as of February 2, 1953. Maximum attendance of 146 at the Nevada Site is scheduled for the week of March 16. A "Security Guide for the Civil Effects Group and the Test Operations Group" has been prepared for personnel use during the operation. The guide specifies security responsibility and prescribes procedures for such matters as personnel clearances, physical security, and the like for participating personnel.

Biomedical experiments (Program 23). Under the civil effects program, an extensive series of genetics tests will be conducted. The overall objective is to determine the kinds of mutations and the dosage-frequency curve resulting from the fast neutron irradiation of the atomic bomb.

The objects to be exposed are the classic genetic test materials which have been used for establishing the mechanism of heredity and from which data may be extrapolated to human subjects. The fruit fly, Drosophila, employed spontaneously and following X irradiation and gamma irradiation, has been the most used object for studies of gene mutation frequency. Plant material, especially the buds of the spiderwort, Tradescantia, has been very useful in determining the special kinds of mutations due to chromosome breaks. Such species are fairly hardy, and they will be compared with other material such as wasps, corn, and jimson weed seeds, and also fungi and bacteria. At lower dosages a small number of mice will be exposed in order to get comparisons with a warm-blooded mammal like man. All of these specimens will be exposed to neutron beams (with gamma rays screened out) in containers sunk in the ground at appropriate intervals from ground zero and covered with heavy lead shields. It is hoped to have at least preliminary data on the genetic effects of fast neutrons by breeding tests at a number of University laboratories and at Oak Ridge National Laboratory within a few weeks after the tests. If, after evaluation of both data, it appears necessary to repeat any experiments, they will be made at a later date in the test series. (End of [redacted] section.)

Telemetering of radiological data [redacted] Laboratory tests have been completed of the telemetering system which will be in operation during test activities at the Nevada Proving Ground. A radio-frequency link is used in the system to transmit information on radiological as well as meteorological conditions from areas within and surrounding atomic test sites. The equipment has been shipped to the test

[redacted] SECURITY INFORMATION

site for field evaluation and use in the coming test operations. The telemetering system, if successful, should replace many of the monitoring teams and their equipment which are now required to effectively monitor areas surrounding the test site.

Residual environmental contamination--TUMBLER-SNAPPER data. Observations on the intensity of radioactive fall-out in areas near the Nevada Proving Ground have been continued since the continental test series in 1952 (TUMBLER-SNAPPER). Calculations from the data observed at Groom and Lincoln mines, and the town of Pioche, show that in January, 1953, residual levels of activity should amount to about 0.5, 0.1, and 0.5 milliroentgens per hour, respectively. Actual observations, however, show that the radiation levels are approximately normal background — that is, 0.02 - 0.03 milliroentgen per hour. It thus appears that in addition to radioactive decay, other factors such as weathering (scattering by winds and penetration into soil as a result of snow and rain) are effective in reducing residual environmental dosage effects far below the levels which have been considered. It may be that further studies on this question will indicate that environmental hazards due to radioactive fall-out in populated areas near the site have been overestimated. (End of [redacted] section.)

Research Activities (UNCLASSIFIED).

Fast neutron exposure at ORNL. Exposure of biological material (Tradescantia and mice) to fast neutrons will be made in order to compare results with those obtained from experiments at the Nevada Proving Ground. For this purpose, a lead enclosure has been installed at the Y-12 cyclotron at Oak Ridge. Preliminary investigation of the neutron dose indicates that fluxes up to 10^9 neutrons/cm^2/sec are available with a small gamma-ray component. Measurements of the dose rate in roentgen equivalent physical units were obtained by the use of a tissue-equivalent ionization chamber. This instrument will also be used in the test series.

Radiation decomposition of labeled compounds. At the University of California, Berkeley, it has been found that certain organic compounds labeled with carbon 14 have undergone decomposition as a result of the radiation from the carbon 14 in the molecule. Changes have been observed in the following: valine, norvaline, norleucine, choline chloride, calcium glycolate, and cholesterol. The percentage decomposition varied in the different compounds. These findings demonstrate the necessity of checking the purity of stored labeled compounds.

Detection of cancer by isotope localization. A gamma ray scanner has been developed at the University of California, Berkeley, for the localization of radioactive isotopes in the human body. A movable portion of the apparatus, bearing a series of small radiation detectors which record as dots on a photographic film, is passed over the reclining patient. By this scanning procedure a picture or image of the patient is formed as a pattern of dots, each one of which represents a given degree of radioactivity. The number of dots in an area show the radiation in a particular

portion of the body. This technique when used with radioiodine permits the detection of thyroid cancerous growths in various parts of the body.

Effects of irradiation on amino acids. Studies are being conducted at Reed College, Portland, Oregon, to determine ionizing effects on biochemical compounds, such as the animo acids. One of these acids, cysteine, has been found to give some protective action against radiation when fed to animals prior to irradiation. No evidence as to the nature of this protective action is apparent. It has been found, however, that several unknown products are formed when cysteine is subjected to X radiation from a cobalt 60 source. In recent experiments, one of the products formed was identified as alanine (also an amino acid). This has not been demonstrated previously, and studies will be continued to determine whether the products formed by the decomposition mechanism bear any relation to the protective action of cysteine.

Toxicity of iodine 131 in sheep. Iodine 131 is a principal constituent of concern in the disposal of gaseous wastes emitted by the separations plant stacks at Hanford. In order to obtain data on iodine toxicity to establish firm permissible exposure limits, a continuing experiment utilizing sheep, the common grazing animal of the region, was initiated at Hanford in 1950. Specifically, the immediate objective was to determine the permissible concentration of iodine 131 on vegetation contaminated by stack effluents. Doses of I 131 up to 5 millicuries per day were fed to sheep for 20 months. Results indicate that no pathology was evident in the thyroid or in any other tissue. Since the amount of radioactive iodine fed to the sheep was many times the amount of intake from local vegetation, the danger from fall-out hazard would be considered minimal. However, supplemental studies will be conducted to determine possible application to man, as well as animals.

Development of organ perfusion apparatus. A medical research group at the University of Minnesota has developed, in the course of their studies on porphyrin metabolism, an inexpensive organ perfusion apparatus. The device has been used by this group for various organ perfusion experiments including liver, whole leg, heart, kidney, spleen, and thyroid. This apparatus will circulate several hundred milliliters of blood per minute and can be adjusted for either a controlled rate of blood flow or a controlled pressure (either constant or pulsating), with automatic compensation to correct for changes in resistance of the organ.

While its use to date has related primarily to isotopic studies of porphyrin synthesis by the liver, it is expected that the apparatus will eventually prove of value for a variety of other biochemical and histochemical studies.

General

Conference on infection and immunity factors. A conference on infection and immunity as factors in the response to whole-body irradiation, sponsored by the division, was held in Washington on February 20,

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1953. In attendance were representatives from Commission laboratories, off-site research contractors, the National Institute of Health, and the Department of Defense. Brief informal summaries of recent developments at the respective laboratories stimulated discussion and comparisons of related data. This meeting, which was a follow-up of a similar meeting held two years ago, was considered successful in providing a mutual exchange of information. This will aid in expediting progress in the most promising directions, prevent any undue duplication of effort, and encourage renewed interest in resolving problems in this area. (End of UNCLASSIFIED section.)

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