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NORTH STATUS AND PROGRESS REPORT
Division of Biology and Radiobiology
NORTH OF DECEMBER, 1952
403972
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Research Activities
Use of Isotopes in Detection and Treatment of Brain Tumors. (UNCLASSIFIED)

1. Within the Department of Neurosurgery at the Massachusetts General Hospital in Boston, considerable progress has been made in the development of instruments and techniques to aid in the external localization of brain tumors.

The bulk of the research has been carried out with animals in which tumors have been induced. Position emitting isotopes are administered intravenously and on the basis of selectivity concentrate in oncogenic and normal tissues in varying ratios. A slightly higher concentration in the tumor mass enables the investigators by coincidence counting (with newly developed instruments) to locate the tumor mass within the head. This technique is expected to be of such value in diagnosis and treatment of brain tumor, or other diseased tissues imbedded in critical areas of the body which make it difficult to locate or treat.

2. Another development involving the application of longlived radiation in the possible treatment of brain tumors has been reported recently by the research group at Northwestern University Medical School in Chicago. In experiments with 50 healthy adult rats, small pieces of gelfoam impregnated with radioactive colloidal gold or thoracic phosphate were implanted in the brain tissues of the animals. Following sacrifice of a limited number of animals, a 1-3 millimeter zone of necrosis was found surrounding the site of implantation. After several weeks, however, it was found that the dead tissue in the remaining animals was replaced by regenerating tissue, and the only effects detectable were those of surgical trauma. These results suggest the possible therapeutic application of radioactive gold or thoracic phosphate to insure complete eradication of diseased tissue following surgery.

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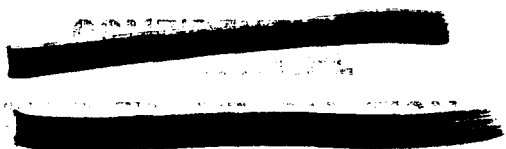
Carcinogenic Action of Calcium-45. (UNCLASSIFIED) Preliminary studies on the biological effects of radioactive isotopes are being made at Marquette University. In experiments with mice, small weekly doses of Ca-45 were administered. It was apparent that bone tumors were produced as a result. As these weekly dosages were increased,^{raised} the number of bone tumors in the animals were found to increase. The formation of neoplasms of the bone is thus one pathological effect found from the injection of Ca-45. Additional studies are under way to obtain statistically significant data of the effect of concentration on tumor incidence.

Study of Chemical Processes. (UNCLASSIFIED) It is known that chemical changes are induced in living cells by ionizing radiations. Thus basic studies of the chemical composition of living matter and chemical reactions are essential in understanding the effects produced by outside agents. One of the most important ingredients of living material affected by ionizing radiation is the nucleic acid component. Recently, a valuable new line of attack on the structure of nucleic acids has been developed by a Washington University research group. By splitting the complex molecules of nucleic acid in a methanol medium, it has been possible to determine the incidence of certain terminal groups and cross-linkages, which are not separable by simple hydrolytic procedures.

Related studies also include research with a variety of phosphorylated compounds. Synthesis of these particular compounds has previously been handicapped by sensitivity of parts of the molecule to changes in hydrogen-ion concentration and other factors complicating the use of aqueous solutions. The Washington University group, however, has developed a method which promises to circumvent these difficulties through the use of free-radical preparations in others.

Effects of Alpha Radiation. (UNCLASSIFIED) At the Radiation Laboratory of the University of California, experiments are being made with animals to ascertain the effects of alpha particle irradiation upon the eye, as a possible treatment for intra-ocular cysts. A number of monkeys received injections of radioactive astatine into the anterior chamber of the eye. In the group which received 200 microcuries, it was observed that the astatine moved into the blood stream and produced almost complete destruction of the thyroid tissue. As a result one of the animals developed characteristic myxedema, shown especially by loss of hair. When this animal was placed on a diet of thyroid substance in milk, he returned rapidly to normal. This discovery has given a new experimental method for the study of the uptake of radio-iodine in the thyroid, as well as possible injury or changes in the pituitary.

but the radioactive material was removed too quickly to be used as an effective treatment.



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Oak Ridge National Laboratory

1. Skin Permeability of Mice Increased. (UNCLASSIFIED)

Exposure of mice to sub-lethal x-ray doses produces an increase in the permeability of the dermal layer of the skin. This has been demonstrated by studies of the spread of dye through the skin of mice with x-irradiation. It is believed that increased permeability of the dermal connective tissue layers begins five to seven days following whole-body radiation.

2. Decrease of Vital Factor within Bacterial Cells.

(UNCLASSIFIED) A decrease of ATP (adenosinetriphosphate) was noted inside the cells of bacteria which were exposed to 60,000 roentgens of x-irradiation. Experiments show that although synthesis of this vital material continues, changes produced in the cell through irradiation permit leakage of ATP to the exterior. Addition of metabolites like pyruvate, succinate, or glutamate to the medium, or a lowering of the temperature, tended to decrease this loss of ATP to the external medium. ATP is necessary for cell metabolism, and these secondary effects of irradiation could influence general cell death.

Civil Defense Activities

Bomb-Resistant Shelter - National Gallery of Art. [REDACTED]

A shelter to safeguard art treasures and personnel has recently been completed at the National Gallery of Art. The shelter is one of the most bomb-resistant structures of its type in the Washington area. Professor H. L. Bowman, consultant to the Commission on protective construction and civil defense, participated in the planning of the shelter and furnished technical advice as to thickness of cover, design loads, emergency exit facilities, and other features of the project.

Department of Defense Survey. [REDACTED]

(UNCLASSIFIED) The Commission is participating in a study sponsored by the Department of Defense for the evaluation of the effects of enemy attack on an atomic energy plant. This is being coordinated by the Division of Production, and Professor Harry L. Bowman of the Division of Biology and Medicine will serve in a part-time capacity as consultant. The principal purpose is to assess the effects of such an attack on equipment and production, and to determine, if possible, the time required to restore production following attacks of differing severity. Results of the project are primarily for the use of the Department of Defense activities but will also be of value to the Commission.

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FCDA Participation in Operation UPSHOT-KNOTHOLE. (UNCLASSIFIED)

The Federal Civil Defense Administration request for an "open" shot at UPSHOT-KNOTHOLE series for demonstration and training purposes, previously reported, was concurred in by the Commission on December 30, 1952 subject to certain conditions. Briefly, these involve assumption by FCDA of responsibility and costs for housing, messing, and transportation of civil defense observers, office space, auditorium space, and related services for briefings, communications for news media, and any other costs directly attributable to the "Open Shot." The pattern to be followed operationally will be similar to that for the TUMBLER-SNAPPER shot (April 19-22, 1952) with the addition of pre- and post-shot viewing by civil defense and news media observers of the FCDA technical projects in the firing area.

General

Argonne Cancer Research Hospital. (UNCLASSIFIED) The newly completed Argonne Cancer Research Hospital will be administered under contract with the University of Chicago. Dr. Leon O. Jacobson, Professor of Internal Medicine at the University, has been appointed as Director, with Dr. Robert Hasterlik of the Health Services Division of Argonne National Laboratory as Associate Director.

The 58-bed hospital has complete laboratory facilities and will have available a variety of sources of ionizing radiations. These include a 180 KV Van De Graaff machine, a Cobalt-60 teletherapy source, a linear accelerator producing 1 to 47 MEV electrons, and the University of Chicago synchrotron which produces 510 MEV alpha particles. The sources will be used for both research and clinical studies in the diagnosis and treatment of experimental cancers and whole body radiation injury.

Report on Atomic Bomb Casualties. (UNCLASSIFIED) An English translation of the report of the Japanese Special Committee on Atomic Bomb Casualties (Subcommittee on Medicine) has been published by the Atomic Bomb Casualty Commission. The report includes a summary of the studies made by Japanese physicians on the casualties directly following the bomb explosions in Hiroshima and Nagasaki. Since these investigations were made before the ABCC was organized, the report will be valuable as a supplement to the studies being continued under the ABCC project.

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General Instrumentation Conference. (UNCLASSIFIED) A General Instrumentation Conference sponsored jointly with Brookhaven National Laboratory was held at Brookhaven on December 3, 4, and 5. The purpose of this meeting, the first of its type, was to bring together various groups in the instrumentation field within the Commission and other Federal agencies. The increased importance of instruments for radiation detection, reactor, health physics, and biomedical research necessitates the establishment of a well-coordinated program. The exchange of technical data and information on new developments and devices provides an extension of experimental production without undue duplication and testing.

Approximately 60 persons were in attendance representing ABC installations, the Department of Defense, and the Federal Civil Defense Administration. The program included 37 papers on current research and progress.

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