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MONTHLY STATUS AND PROGRESS REPORT, NOVEMBER 1953 -
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 1953.

Enclosure:
Report

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MONTHLY STATUS AND PROGRESS REPORT

Division of Biology and Medicine

MONTH OF NOVEMBER, 1953

Research Activities

Uses of Thorium X for Skin Cancers. (UNCLASSIFIED) Investigators at New York University are experimenting with thorium X (disintegration product of thorium) which has been used for many years in the treatment of certain skin conditions. In certain concentrations, application of this radioactive material to the skin of man causes erythema and pigmentation. The relative biological effectiveness of the beta and gamma components of thorium X is many times less than that of the alpha components, and it now appears that the observed effects are due to the alpha particle components. Selection of a suitable material in which thorium X can be incorporated for application might make it possible to permit penetration into the skin, thus depositing the radioactive material below the surface. The effects from alpha bombardment at the surface might be avoided in this way. Further explorations will be made to determine suitable application methods.

Measure of Radium in Food and Water. (UNCLASSIFIED) A University of Rochester research group has made studies of the radium content in a limited number of common foods, and in water sources from which city tap water is used. It is a well-known fact that radium occurs in small amounts in water and certain foods. Since it is known that radium accumulates in the skeletal tissues of the body, these studies are important in determining if ingestions of small amounts of radium from food and water constitute a health hazard.

Radium content was measured in water sources of 41 cities in the United States. The tests show that in general ground water from deep wells have the highest concentrations of radium, although the Mississippi, Missouri, and Allegheny rivers, three important water sources, also have relatively high radium levels. Of all the water sources measured, only four showed concentrations more than 5×10^{-16} curies of radium per milliliter. Measurements of the tap water corresponding to the four sources revealed a value of $0 - 1.7 \times 10^{-16}$ curies of radium per milliliter, with the exception of water at Joliet, Illinois, which measured 58×10^{-16} curies of radium per milliliter. The radium content of foods (i.e., powdered milk, fish, peas, barley, and beef) fall in the range from 0.74 to 6.5×10^{-15} curies of radium per gram of material. Beef, however, contained no measurable amounts of radium.

The National Radiation Protection Committee recommends a maximum permissible concentration of radium water for continuous use of 4×10^{-8} microcuries per cubic centimeter. This is equivalent to 4×10^{-14} curies per milliliter or curies per gram. Approximately the same value measured in curies per gram would apply to the total quantity of food consumed. Thus, it is indicated from these studies that tap water and the common foods used in the United States appear to be well within the permissible limits for radium.

Radiation Effects on Tobacco and Potato Plants. (UNCLASSIFIED)

A species of tobacco was planted this year in the gamma field at Brookhaven National Laboratory. Results show that irradiation produced a moderately high rate of spontaneous tumors. In the gamma field, the tumor-induction rate at fairly high dosage rates (300 r/day) was greatly increased over the control lot, not only in numbers of tumors per plant but in size of the individual tumors. This is the first report of a tumor in plants induced by gamma radiation, although radiation induced tumors have been recognized in animals for many years.

Experiments on the effect of radiation on the "keeping" qualities of potatoes were completed by Brookhaven National Laboratory recently. A quantity of potatoes was secured and divided into five lots, four of which were given various radiation doses and the fifth kept as a control. The potatoes later were all stored under conditions comparable to standard potato storage conditions, and samples were taken periodically from each lot and tested for taste and then graded according to standard potato-grading procedures. At the final test period on August 15, the control lot was essentially spoiled, whereas those that had been exposed to 20,000 r were still Grade A potatoes in all respects. Potatoes exposed to about 50,000 r might be classed as Grade B potatoes, and those exposed at 80,000 r were also Grade B potatoes. What apparently happens is that, in late spring, potatoes tend to sprout and these sprouts release an enzyme responsible for the breakdown of the starch. Sprouts are inhibited by relatively small doses of radiation, and consequently the starch is not broken down. At the higher doses, apparently, there is enough cellular destruction to cause a general breakdown over a long period of time. Whether these explanations are correct or not is debatable, but there seems to be little doubt now that this is a real phenomenon, since it was observed last year quite accidentally in connection with some other work, and the experiment this year was designed specifically to prove this point.

Typing of Blood Platelets. (UNCLASSIFIED) Discovery of groups and types for blood platelets was announced recently by the New England Medical Center at Boston, Massachusetts. Platelets are colorless, disk-shaped bodies found in the blood of humans and all other mammals. They

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play a part in the blood-clotting mechanism, but are still not well understood. Ionizing radiations to the entire body produce among other effects a reduction in the number of blood platelets from, in some instances, actual total cessation of platelets. In this connection, it is interesting that animals have been protected from lethal effects through transfusion of platelets from the blood.

The platelets can now be typed and grouped, much as red blood cells are before normal blood transfusions. There is no correlation, however, between the platelet groups discovered and the familiar groups of red blood cells. Continued efforts may prove of significant value in combatting such maladies as thrombocytopenic purpura, a blood disease in which bleeding occurs under the skin and internally. In adults suffering from this type of hemorrhagic disease, the gradual failure of repeated platelet transfusions may be due to incompatibility of the donor's platelets with those of the patient. A similar condition also occurs in newborn babies and this may be due to platelet incompatibility between mother and newborn child, in a way similar to Rh incompatability.

Effects of Prenatal X-irradiation on Mice. [redacted] In studies of the effect of radiation on embryos of mammals and other organisms, it is necessary to observe changes induced in one or more variable organs or organ systems. In research in progress at Oak Ridge National Laboratory, the vertebral column and thorax have been used as indicators of radiation damage to the developing mouse. The particular question being investigated is whether radiations cause general damage to the embryo at any exposure time or whether radiations cause specific changes at specific radiation susceptible times. Mice embryos were irradiated at stages of development corresponding to ages of 1/2 day, 1-1/2 days, 2-1/2 days, and so on to 13-1/2 days after conception. At birth the skeleton of each embryo was studied in detail. It was found that each skeletal abnormality was, in general, induced by radiation during only a short period of prenatal development and was obtained with high incidence when radiation was applied in that period. The "critical periods" for the characteristics studied fell between 6-1/2 and 13-1/2 days after conception, during which time irradiation produces very little mortality. The abnormalities produced by irradiation resemble, but do not exactly coincide to, some of the abnormalities produced by previously identified mutant genes in the mouse.

Civil Defense

Dissemination of Weapons Test Information. [redacted] A recent meeting was held with members of AEC, the Department of Defense, and the Federal Civil Defense Administration. The discussions covered the transmission to FCDA of classified weapons effects information derived from

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tests and associated projects under terms of the Joint Chiefs of Staff Directive to the Armed Forces Special Weapons Project controlling such dissemination. The following decisions were reached: (1) AFSWP agreed to make available height of burst curves and new curves on neutron flux, previously withheld under the JCS directive, and to translate into more readily useable form transmittable data; (2) the FCDA representatives concurred that no change in the JCS directive would be pressed, since it generally permitted the forwarding of most, if not all, of the data needed for civil defense planning, and that any problem arising in this connection in the future could be discussed on a case-to-case basis.

Future Test Programs. (UNCLASSIFIED) Needs of the Federal Civil Defense Administration for participation in possible future continental weapons test programs were outlined in a recent informal meeting with FCDA Administrator and the Chairman of the Commission and staff members. AEC willingness to cooperate in all ways possible was expressed by the Commission Chairman. It was agreed that specific FCDA proposals would be submitted for consideration at a later date.

Technical Assistance Rendered. (UNCLASSIFIED)

a. At the request of the Federal Civil Defense Administration, design criteria for protective construction standards to be publicly released as guidance to federal agencies and the public in erecting structures in or near designated target areas have been reviewed by the Commission. FCDA has incorporated much of the AEC material in its proposed publication "Standards and Criteria for Protective Construction - Class I Buildings" which is now undergoing classification review.

b. The problem of providing shelters in Navy Department Bureau of Ships installations at Navy Yards was discussed with the Chief Design Engineer, Public Works, Bureau of Ships. Based on discussion of design criteria, materials, and probability of accomplishing objectives of the Navy, further study will be conducted by Bureau of Ships considering the construction of dual-purpose reinforced concrete buildings to provide the shelter required.