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Monthly
REVIEW
of
ACTIVITIES

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II - BIOLOGY AND MEDICINEResearch Activities

Use 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. A University of Rochester research group has made studies of the radium content in a limited number of common foods and in sources of city tap water. 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 whether ingestions of small amounts of radium from food and water constitute a health hazard.

Radium content was measured in water sources for 41 cities in the United States. The tests show that in general ground water from deep wells has 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 values from 0 to 1.7×10^{-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) fell 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 value 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.

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Radiation effects on tobacco and potato plants. 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 roentgens per 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 tumors 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 recently. A quantity of potatoes was divided into five lots, four of which were given various radiation doses and the fifth kept as a control. All the potatoes later were stored under conditions comparable to standard potato storage conditions. Samples were taken periodically from each lot, tested for taste, and then graded according to standard potato-grading procedures. At the final test on August 15, the control lot was essentially spoiled, whereas those that had been exposed to 20,000 roentgens were still Grade A potatoes in all respects. Potatoes exposed to about 50,000 roentgens might be classed as Grade B potatoes, as were those exposed at 80,000 roentgens. It appears 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. Although the correctness of these explanations may be questioned, the existence of the phenomenon has been established. The radiation effect 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. 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 play a part in the blood-clotting mechanism, but are still not well understood. Ionizing radiations on the entire body produce among other effects a reduction in the number of blood platelets and, in some instances, actual total cessation of platelet activity. 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

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platelets with those of the patient. A similar condition which also occurs in newborn babies may be due to platelet incompatibility between mother and newborn child, in a way similar to Rh incompatibility. (End of UNCLASSIFIED section.)

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 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 half-day intervals during early stages of development up to 13½ 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 6½ and 13½ days after conception, during which time irradiation produces very little mortality. The abnormalities produced by irradiation resemble, but do not exactly coincide with some of the abnormalities produced by previously identified mutant genes in the mouse. (End of section for [REDACTED])

Civil Defense (UNCLASSIFIED)

Dissemination of weapons test information. A recent meeting was held with members of AEC, the Department of Defense, and the Federal Civil Defense Administration to discuss the transmission to FCDA of classified weapons effects information. The transmission of such data derived from tests and associated projects is controlled by the terms of a Joint Chiefs of Staff directive to the Armed Forces Special Weapons Project. AFSWP agreed to make available height of burst curves and new curves on neutron flux, previously withheld under the JCS directive, and to translate the data into more readily usable form. 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. It was also agreed that any similar problem arising in the future could be discussed on a case-to-case basis.

Future test programs. Needs of FCDA for participation in possible future continental weapons test programs were outlined in a recent informal meeting of the FCDA Administrator with the Chairman and AEC staff members. The Chairman expressed AEC willingness to cooperate in all ways possible. It was agreed that specific FCDA proposals would be submitted for consideration at a later date.

Technical assistance to FCDA. At the request of FCDA, the Commission received design criteria for protective construction standards

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to be publicly released as guidance to federal agencies and the public in erecting structures in or near designated target areas. 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.

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 to consider the construction of dual-purpose reinforced concrete buildings to provide the shelter required.

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