

ATTENTION: R. D. O'Neill, Administrative Officer  
F. Laner

November 23, 1953

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PROGRESS REPORT FOR MONTH OF NOVEMBER, 1953. BIOPHYSICS BRANCH.

1. Radium in Food and Water. UNCLASSIFIED

Since radium is known to accumulate in the skeletal tissues of the body, it is reasonable to ask whether the day by day ingestion of the small amounts of radium in food and water constitutes a health hazard. The University of Rochester has determined the radium content of the source of tap water used by 41 cities in the United States. They found in general that ground water from deep wells showed higher concentrations of radium, although the Mississippi, the Missouri and the Allegheny rivers, three important water sources, showed relatively high radium levels. Of all the water supplies measured only four showed concentrations more than  $5 \times 10^{-16}$  gm radium per milliliter. Measurement of the corresponding tap water revealed a range of radium concentration (excepting one value) of  $0 - 1.7 \times 10^{-16}$  gm radium per ml. The exception was the water of Joliet, Illinois which measured  $58 \times 10^{-16}$  gm radium per ml.

The radium content of a number of foods (i.e., powdered milk, fish, peas, barley and beef) were measured. With the exception of beef, which contained no measurable amounts of radium, the foods tested fell in the range from 0.74 to  $6.5 \times 10^{-15}$  gm Rn per gram starting material.

From these studies it is evident that the tap water and the common foods used in the United States are well within the permissible limits for this radioisotope.

2. Method for Detecting and Determining Exact Position of Malignant Brain Tumor. UNCLASSIFIED

The task of developing improved methods for detecting and determining the exact position of a malignant tumor of the brain without resorting to extensive exploratory surgery is a continuing and important one. Of the various procedures that have been tried several have shown definite promise. One of these which has been shown to give increasingly better results as the techniques are refined is the isotope method. The principle of this detection method depends on the abnormal concentration of radioactive isotopes in the malignant tissue over that of surrounding normal tissue. At Washington University,

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St. Louis, Missouri, an investigation of this method has been made for several years in which over 200 patients showed some symptoms of brain tumor. By injecting diiodofluorescein labelled with I-131 and surveying the skull with a specially developed sensitive scintillation counter the tumors of 30 patients out of 65 on which this particular method was used were correctly localized, or an accuracy of 46 per cent. Although this method has definite limitations, continuing use and improvement should make this a useful tool to the brain surgeon in his efforts to increase the survival rate in patients with this usually fatal type of tumor.

3. Thorium X In Treatment of Skin Cancer UNCLASSIFIED

Many opinions have been expressed regarding the biologically-effective radiations emanating from thorium X, and various theories have been postulated to account for the frequently observed erythema and pigmentation which follow the application of this radioactive material to the skin of man.

After a three year study of this problem a group of investigators have concluded that the alpha particles bombarding the skin from the surface are capable of producing erythema and pigmentation. The relative biological effectiveness of the beta and gamma components of the thorium X is many times less than that of the alpha component as judged by the degree of erythema and pigmentation produced. It was further observed that selecting a suitable vehicle, thorium X can be made to penetrate the skin and thus deposit this radioactive material below the surface. The biological effectiveness of this radioisotope is thus greatly enhanced in the treatment of skin cancer and other pathological conditions of the skin.

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