EXCERPTS FROM AEC SEMIANNUAL REPORTS

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Page 38

Eniwetok Test Series Announced

On January 12, 1956, the Commission and the Department of Defense jointly issued the following announcement:

"In the absence of effective international agreement safeguarded by adequate inspection to limit or control armaments, the United States Governement continually endeavors to maintain the most modern efficient military strength for purposes of peace. Pursuant ot this course, preparations are under way for a series of nuclear tests to begin in the spring at the Eniwetok Proving Grounds. One of the important purposes of this series will be the further development of methods of defense against nuclear attack.

"Air and sea traffic will be notified through normal channels of the details of the control area well in advance of the commencement of operations.

"Operations will be conducted by Joint Task Force 7, commanded by Rear Adm. B. Hall Hanlon, USN. Dr. Alvin C. Graves, Los Alamos Scientific Laboratory, is Deputy Commander for Scientific Matters."

Chairman Lewis L. Strauss, of the Atomic Energy Commission, made the following supplementary statement in response to published speculation and inquiries of correspondents.

"The forthcoming series of nuclear tests at the Eniwetok Proving Grounds, as announced today by the Commission and the Department of Defense, will involve weapons generally smaller in yield than those tested during the 1954 test series.

"It is anticipated that the energy release of the largest test will be substantially below that of the maximum 1954 test."

To this end an experimental facility for the irradiation of solids at temperatures in the neighborhood of 20° Kelvin (−253° C.) has been installed near the center of the Graphite Reactor at Oak Ridge. The facility consists of a refrigerated specimen chamber which is cooled by a helium refrigerator. The rate of disordering of specimens held in the reactor at a temperature of 20° K has been measured for a number of metals and alloys, using the change of electrical resistivity as an index of lattice damage. The electrical resistivity of the metal is known to increase with the lattice.

It was found that there is apparently a wide variation in both the disordering rate and the thermal stability of lattice disorder for the metals studied. The order of their increasing rates of resistivity change is: gold, copper, brass, aluminum, nickel, cobalt, iron, zinc, Cu Au (disordered), Cu Au (ordered). Appreciable amounts of the increase in resistivity could be eliminated by warming the specimen to room temperature except for iron and zinc, which require higher temperatures.

Biology and Medicine

The effects and uses of radiation are constantly under study by the Commission at its National Laboratories as well as by a large group of investigators working at Commission facilities or in the laboratories of universities, colleges, hospitals, and other research institutions.

As more and more data have been obtained it has become possible to utilize radiation beneficially in an increasingly wide variety of fields. These research studies are also supplying information which will lead to perfecting methods of protection against the harmful effects of radiation—a most important consideration in view of the increasing use of atomic energy for industrial purposes.

In this report examples of the kinds of research under way and the practical applications of such research are given. These examples cover only a small part of the overall program of medical and biological research, but are believed to be typical of the effort in that field. Other areas of participation are also reported.

Long-Term Effects of Fall-Out From Nuclear Weapons

The subject of this section is necessarily one in which the conclusions may vary over a wide range. In these circumstances the Commission furnishes the following as the best estimate of its staff.

Radioactive materials disseminated in the atmosphere from large-scale use of nuclear weapons in warfare probably would affect large segments of the world's population. The Atomic Energy Com-

[illegible]

Hazards from [illegible]

1. Exposure of persons [illegible] radiation from radioactive [illegible] other external [illegible]
2. Exposure of body [illegible] in the body [illegible]

The relative importance of [illegible] would depend upon the [illegible] after detonation [illegible] and upon relative [illegible] of the other. If no special precautions [illegible] expected that [illegible] of heavy fallout [illegible] would be more important [illegible] weeks or months after the detonation.

The quantities of radioactive [illegible] probably would be taken into the bodies of members of [illegible] groups [illegible] of nuclear warfare [illegible] factors. These [illegible] include the [illegible] of weapons [illegible] of targets [illegible] yields and [illegible] of weapons [illegible] of radioactive [illegible]. Some of these factors would depend [illegible] physical and chemical [illegible] soils and the [illegible]

[illegible]

All of these [illegible] the [illegible] which [illegible] warfare. Their [illegible] very difficult to [illegible] for laboratory [illegible] from [illegible]. O[illegible] problem [illegible] is the fact that weapons [illegible] have produced small but measurable quantities of [illegible] air, soil, water, foods, [illegible] to the natural radioactivity [illegible]

Of course, [illegible] might affect the entry of radioactive [illegible] the event of nuclear warfare would be [illegible] present nuclear testing program. Nevertheless, [illegible] differences can be estimated.

and their influence upon total body [illegible] radioactive [illegible] can be predicted on the basis of [illegible] field studies.

Radioactive fission products of particular [illegible] are isotopes of iodine and of strontium.

Since iodine concentrates in the thyroid, comparatively small quantities of radioiodine taken into the body give the thyroid large doses of radiation. However, the potential hazard from this source is less serious than it might otherwise be due to the short half lives of radioisotopes of iodine, to the comparative insensitivity of the thyroid to radiation, and to the possibility of survival without the thyroid.

The radioisotopes of strontium are of importance for a number of reasons:

1. They are among the more abundant of the fission products.
2. Because of their great chemical similarity to calcium, which is an essential element in the nutrition of both plants and animals, they are readily taken up and metabolized.
3. Sufficiently high concentrations of radioactive strontium in the skeleton will result in serious injury to the bone, and may lead to eventual death of the patient from cancer of the bone.
4. The half life of one of the isotopes, strontium 90, is sufficiently long (about 28 years) so that short term protective measures, such as stockpiling of foods, would be impracticable.

The chemical and physical properties of strontium 90 permit its detection in very low concentrations. Since its occurrence in the environment is almost entirely due to its production by nuclear explosions, it is possible to determine with considerable accuracy its occurrence in soils, plants, animals, and human beings in relation to the explosions which produced it.

Concentrations of Strontium 90 in Human Bone

Assays of fragments of human bone available from routine surgical operations indicate the degree to which strontium 90 has entered the skeletons of persons of various ages. The highest concentrations have been observed in children, amounting to about one micromicrocurie (one trillionth curie) of strontium 90 per gram of skeletal calcium. Assays of vegetation, animal tissues and milk indicate the principal paths by which strontium 90 enters the body and, with other data, provide a basis for estimating the dependence of such entry upon pertinent factors.

It is believed that skeletal concentrations of strontium 90 expected to produce observable skeletal injury to human beings are several thousand times those which have been observed in the United States.

Concentrations required to produce [illegible] may range from ten thousand to more than a hundred [illegible] times those which have been observed. These degrees of [illegible] exist because there is no specific experience involving injury [illegible] beings by radioactive strontium. The estimates are based on [illegible] study of the effects of radium in the human skeleton, coupled [illegible] experimental studies of the comparative effects of radium and strontium 90 in animals.

Concentrations of radiostrontium in the bones of grazing animals, as a result of weapons tests to date, are found to be several times higher than in human beings, although still far below amounts which are hazardous. This difference arises largely from the fact that grazing animals obtain their needed calcium (and other food requirements), by consuming large quantities of vegetation. The radioactivity in the bones of these animals depends on the quantity of radioactive debris that has settled on the plants from the air. Humans, on the other hand, obtain more than half their calcium from milk which has been screened somewhat by the animal body to remove much of the strontium.

The Atomic Energy Commission is continuing its studies to provide data for civil defense purposes and to evaluate carefully the dangers to mankind that might result from a large-scale nuclear war.

Research Activities

Radiation Effects on Reactivation of Typhus Infection

Experiments with monkeys at the Johns Hopkins University School of Public Health indicate that moderately incapacitating doses of ionizing radiation frequently reactivate latent epidemic typhus infections in animals which had completely recovered from the disease several months prior to the irradiation. Heavy doses of cortisone may also lead to reactivation of these dormant infections. This suggests the possibility of a public health hazard, which might complicate the aftermath of a very heavy exposure of densely populated areas to nuclear radiation.

Evidence of a previous typhus infection was found in about ⅓ of a large group of Baltimoreans who emigrated from Eastern Europe some decades ago. Among those persons there has been a small number of cases of apparent reactivation of the disease following incidental treatment with cortisone or radiation.

Further analysis of this question is now planned, with extension of the study to larger similar population groups in other Eastern United States cities. This should provide more significant numbers of such persons who also happen to require cortisone or X ray treatments, and who may be studied following treatment.