

BIOCHEMISTRY-PHYSICS

Atomic Debris Is Deadly

Products of atomic bomb and pile are dangerous radioactive agents which can fatally bombard the bone marrow where blood is made.

► THE DEBRIS from atomic bombs contains the world's most dangerous radioactive agents which can fatally bombard the body's bone marrow where blood is made.

This was discovered in a University of California research that had as its object finding what biological action can be expected from the elements born of atomic fission and of the atomic piles. (*American Journal of Radiology*, Sept.).

The findings are significant primarily for two reasons: 1. They have helped make the nation's atomic production plants and experimental laboratories among the safest there are; 2. They elaborated the implications of the possible biological action of atomic explosions or use of by-products of the atomic piles as a sort of atomic poison gas in warfare.

In a comprehensive report issued under the sponsorship of the Atomic Energy Commission and with acknowledgment to the Manhattan Engineer District, Dr. Joseph G. Hamilton, University of California medical physicist, describes animal research which has been in progress in Berkeley since 1942 on the metabolism of the fission products and the trans-uranic elements.

In a description of the scope of the problem which confronted scientists when they undertook to develop an atomic energy industry, Dr. Hamilton made a comparison with radium. He pointed out that since radium was discovered 50 years ago, one kilogram, or a thousand curies in terms of its radioactivity measurement, has been isolated.

During these 50 years a large number of instances of radium poisoning have occurred, Dr. Hamilton pointed out.

He added that the fission products alone produced in the Hanford atomic piles are in the range of millions of curies, and that kilogram quantities of plutonium have been isolated by complicated chemical processes involving many workers.

Since the trans-uranic elements and the fission products, including nearly 200 isotopes of 34 elements extending from zinc to europium, are with one or two exceptions strange to the human

body or undetectable if present, and consequently nothing was known about their biological effect in 1942, the magnitude of the problem was readily apparent.

Dr. Hamilton and his co-workers have studied the distribution, retention and excretion in the animal body of 20 of these radio-elements, and are continuing research on others.

Included are five elements which are synthetic products of the atomic ovens or of cyclotron bombardments, which are not found in nature. These are element 61, and the trans-uranic elements, plutonium, neptunium, americium and curium. So rare is curium in the world that its metabolism was studied with quantities too small to be visible to the naked eye; only in the last few weeks has a grain-sized quantity of this element been isolated in pure form in the Berkeley laboratories. (*See SNL*, Sept. 27).

The Berkeley scientists duplicated as nearly as possible the possible manner in which poisoning from the radio-elements might occur, through the mouth, nose and scratches or cuts in the skin.

Slices of bone or tissue were then placed on a photographic plate, the radiations from the deposited elements exposing the plate and giving a picture of the distribution of the materials.

Dr. Hamilton said the most significant finding was that many of the highly radioactive groups of elements studied are deposited in a thin layer of tissue, called the osteoid matrix, adjacent to the bone-marrow cavity.

The bone marrow manufactures red blood cells, and is extremely sensitive to radioactivity. Its bombardment by alpha particles emitted by some of the elements could interfere seriously with the multiplication of red blood cells and white corpuscles, the scientists found. Further, the body does not eliminate these elements readily, and they remain radioactive for a long time.

Plutonium, neptunium, americium, curium, and the naturally occurring element, thorium, are included in this group, as well as the fission products, yttrium, zirconium and cerium. Dr. Hamilton said it is probable that others



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