Shadow of the Atom

Poisons No One Can Measure

The Big Problem in Any Study of Effects Of Radiation Is Difficulty of Detection

By Thomas R. Henry
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The extent to which experimental explosion and hydrogen bomb explosions actually are poisoning earth, sea and air, as charged by some geneticists, is extremely difficult to measure and admittedly somewhat debatable.

Still more debatable are the potential effects of any future

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widespread use of atomic energy in industry. Admittedly any adequate protection against these is a stumbling block and will be a major cost item, often overlooked by more enthusiastic proponents.

Long-time poisonous effects of an all-out bomb war between major powers are, of course, far from debatable.

AEC Is Source of Data.

The best and almost only data on this subject is that of the Atomic Energy Commission, whose scientific staff is quite alert to the problem.

A human exposure results in two kinds of radiation. The first is instantaneous—the gamma rays and neutrons emitted by the bomb as they explode. This is truly intense and deadly to most living thing within its [illegible] but is of little significance to people which [illegible] in terms of genetic [illegible].

The second is more lasting. It comes largely from the radioactive products of atomic fission. These form part of the mushroom-shaped cloud which follows an explosion. The cloud soon is taken up by winds. The radioactive particles, for the most part, extremely small [illegible] be carried in the air for [illegible] miles from [illegible] New York to Rochester, N. Y., as the publication explains. They have been recorded from North-ern Siberia to New York City or from Nevada to Moscow. Eventually most of them reach the ground. There some remain, subject to operations to the biosphere and creation of the [illegible] of organisms by [illegible] their presence. Some are quite [illegible] the most atom [illegible] in the continental United States [illegible] creation of a [illegible] amount of radioactivity in the soil according to Atomic Energy Commission.

Eventually [illegible] the radioactive particles which descend to the earth and which are carried a large [illegible] is fully believed which could cause [illegible] in mutations [illegible] genetic variations [illegible] the same report.

Difficulty of Detection.

Geneticists admit all possible precautions have been taken. The difficulty they say, is in the word "detectable" for their thesis is that very few of the thousands of mutations which occur in the germ plasm of human beings can be detected by any means whatsoever, although nearly all of them potentially are [illegible]. Gross readily detectable hereditary differences between child and parents, are rare and of little genetic significance [illegible] point out. This is why eminent students of heredity like Dr. Hermann J. Muller, Nobel prize winner of the University of Indiana, decry any conclusions which may be drawn from studies of the children of persons who suffered heavy irradiation at the bombings of Hiroshima and Nagasaki. To all outward appearances, Dr. Muller holds, they probably will be perfectly normal Japanese babies. There will be few obvious freaks or monsters. But they will carry in their germ plasm, for inestimable generations until their lines die out, the fatal race toxin received by their parents. Such investigations, the geneticists feel, are likely to lead to a false sense of security.

There is an AEC report points out a basic background radiation of all earth and seas to which man has been exposed all the million or so years his race has been on earth. One source is the long-lived, radioactive element contained in the original "Sun stuff" of which this planet was made, especially uranium and thorium. These are only weakly radioactive. They decline very slightly with millenniums. One byproduct of the disintegration of uranium, however, is radium which is powerfully radioactive but is produced in extremely minute amounts. The commission experts estimate that a layer one foot thick and a square mile in area almost anywhere on earth will contain three tons of uranium, six tons of thorium and about a gram of radium. The amount of radium increases as the uranium disintegrates but not sufficiently, in most places, to cause any concern.

Radiation from Outer Space.

Another source of radiation, unknown before atomic bomb days, apparently is more serious. The outer atmosphere of the earth constantly is bombarded by ultra-powerful cosmic rays from outer space. Relatively few of these penetrate the miles of atmosphere to reach the earth's surface but they create radioactive particles out of the atoms of the atmosphere which are distributed all over the world by winds and rains. Most important of these is radioactive carbon, created by bombardment of nitrogen. It combines with the oxygen of the atmosphere to form carbon dioxide by which means, through the process of photosynthesis, it eventually becomes incorporated in every part of every living thing. There it slowly disintegrates. This is now so well established that ages of bones of men and animals dead thousands of years can be estimated by the amounts of radio-carbon they contain. This particular isotope has a half life of approximately 5,000 years. It has been claimed, but not definitely proved, that the supply is being increased by all hydrogen bomb explosions.

Due to all this background radiation, the Atomic Energy Commission estimates, every human being receives from .08 to .8 of one roetgen of penetrating radiation a year, on the average. This is far less than is received from almost any X-ray examination. It causes no observable physical injury. The genetic injury is something quite different.

Due to cosmic ray bombardment persons living in extremely high altitudes, like Tibet or Bolivia, receive much heavier radiation than those living at sea level. Effects on germ plasm may be a fruitful field of study.

The question which it is essential to answer, the geneticists say, is the amount this relatively small amount of residual radiation is being raised by present activities.

Tomorrow: What the Atomic Energy Commission Is Doing.

Glossary of Genetic Terms

The following glossary will be found helpful in connection with Science Editor Thomas R. Henry's seven-story series exploring the effects of atomic radiation on the human race:

Gene—An invisibly minute particle of protoplasm which is the recognized unit of heredity. It has the unique property of finding and bonding together of raw materials around it into an exact duplicate of itself.

Each of the trillions of cells which make up the human body contains the full human complement of thousands of genes. Those in the germs cells are passed on to the next generation.

Chromosome — A fine thread thousands of times longer than thick, differentiated along its length into hundreds or thousands of functionally distinct and individual self-reproducing regions—the genes. Every cell in the human body has 48 chromosomes.

Gamete—The mature germ cell of one individual, plant or animal.

Zygote—The union of two germs cells to constitute a new individual.

Homozygote—An individual who receives identical genes from both parents.

Heterozygote—An individual with parental chromosomes which do not completely match.

Mutation—A change in the gene structure of protoplasm which results in changed hereditary characters.

Half-life—The interval during which half of any radioactive originally present will disintegrate. Uranium has a half-life of several billion years. Radioactive iodine used in thyroid treatments has a half life of eight days. After six half lives, it is calculated, only infinitesimal traces of the original substance will remain.

Roentgen—The accepted unit of radiation defined as "the quantity of gamma or X-rays that will produce a certain electrical conductivity in a cubic centimeter of air under constant pressure and temperature.

Gamma Rays—Exceptionally potent X-rays, the principal radiation causing genetic damage.