

MEDICINE

Radiation Sickness Pill

While scientists and the public alike debate the dangers of radiation, scientists have developed a pill that may protect the individual against these dangers.

► A PILL for humans to swallow and protect themselves from death by radiation is being developed, Dr. R. R. Overman, College of Medicine, University of Tennessee, Memphis, has told SCIENCE SERVICE.

The protective chemical that may be used in it, called AET, has already been found to be 100% effective in mice exposed to lethal doses of radiation, and is now reported to be effective in monkeys. Human trials are underway.

The results of the latest experiments in monkeys with AET were reported by Drs. B. G. Crouch and Overman of the University, in the journal *Science* (May 31). The monkeys were given increasing doses of AET by injection, then subjected to a lethal dose of X-rays. After receiving the X-ray dose their blood counts dropped but began their climb back up toward normal after 18 days. Their blood was completely normal by 65 days.

The big problem with the compound is that it is almost immediately excreted by the kidneys, said Dr. Overman. It is quite likely that a way will be found to prevent this, though, he added.

Experiments have shown the full protective dosage can be given orally and still be effective, so the problem now is finding a way to keep a high level of it in the body tissues over an extended period.

One way to accomplish this would be in a pill made to dissolve very slowly and keep up a certain level of the compound in the body.

Scientists at Oak Ridge have made the drug itself radioactive in order to trace its course through the body. They have found that it concentrates in bone marrow, intestinal mucosa and lymphoid tissue, which are the primary sites of radiation damage. in animals and man.

Preliminary studies of the drug in humans are now going on, to determine how toxic it is. So far, it has been found nontoxic but only a fraction of the amount given to monkeys has yet been tried in humans, Dr. Overman said.

Oral doses of the drug are not nearly as toxic as injections of it, although only injections have been used in humans so far.

Plans are underway to prepare for an actual test in humans if and when there is any kind of an atomic accident requiring persons to enter a highly radioactive area.

AET's full name is S2, B-amino-ethylisothiuronium—Br—HBr and it is cheap and easy to produce.

Our problem now is to get the pharmaceutical industry interested in the drug, since they have the technical know-how for developing a lasting type of oral preparation, Dr. Overman said.

At the present time two pharmaceutical companies are working with the drug and plan to produce it for researchers. It was originally developed as a radioprotective compound by Drs. D. G. Doherty and Ray Shapira, Oak Ridge National Laboratory, Oak Ridge, Tenn., he said.

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When asked whether the accident had any effect on his ability to "increase his family," Dr. Graves replied he had had one child before the accident and since then has had two more.

► OTHER SCIENTISTS testifying before the Congressional subcommittee warned there is no such thing as a "safe" dose of radioactive fallout.

Dr. James F. Crow, genetics professor at the University of Wisconsin and a member of the National Academy of Sciences' committee on the genetic effects of radiation, said that if the present rates of testing atomic and hydrogen bombs continue, "we can be sure hundreds or thousands or tens of thousands or perhaps more persons will be diseased or deformed or die prematurely as a consequence of the fallout."

One of the dangers from fallout, the scientist emphasized, is the unknown total of minor mutations produced. These mutations tend to remain in the population for long periods of time since they are not severe enough to cause death or "gross genetic disease." Many cannot even be detected. The minor mutations can increase a person's susceptibility to disease and generally lower his life span.

Most information on radiation fallout doses is based on studies of a combination "man-mouse-fruit fly," with most research done on the mouse and the fruit fly, Dr. Bentley Glass, genetics professor at Johns Hopkins University, said. Because of this, he pointed out, the NAS committee's estimate of the maximum permissible radiation dose may have to be lowered. Recent experiments indicate radiation has a greater effect on man than it has on flies and mice.

Dr. Glass said he had heard a "rumor" that cesium-137, a fission product present in fallout, has a tendency to deposit in the reproductive organs when it is taken into the body. This means a further genetic danger in fallout may exist. Strontium-90 and other radioactive chemicals, when taken into the body, appear to harm the bone and other tissue not involved in reproduction.

Dr. Glass said a gradual increase over a number of years in money devoted to research in genetics is necessary. He further recommended that a biological scientist be represented on the Atomic Energy Commission itself along with the physical scientists. At the present time there is a committee of biological scientists advising the AEC.

A Human Question

► RADIATION, boon or baleful poisoning of our future? Congressional hearings have been evaluating the differing opinions of scientists and neo-experts.

Here is a case, as often happens in controversies about so-called facts, where there is neither black nor white, but only gradations of truth and implications.

There is little doubt that, in large doses radiation of various sorts, the radiation called ionizing (knocking electrons off of

PUBLIC HEALTH

"Clean" Nuclear Weapons

► THERE IS NO such thing as a "clean" nuclear weapon, Dr. Alvin C. Graves, test director for the Atomic Energy Commission's Los Alamos Scientific Laboratory, reported to the special subcommittee on radiation of the Joint Congressional Committee on Radiation.

Dr. Graves, recovered victim of the famous "screw driver" atomic accident at Los Alamos in 1946, told subcommittee members radiation contamination from a nuclear explosion is inevitable in bombs using the fission process.

Radiation itself is not necessarily a desirable factor in a weapon, but one cannot speak of "clean" or "dirty" bombs in reference to their radiation output. All bombs are "dirty" to some degree, he said.

In 1946, Dr. Graves was one of a small group of scientists working with fissionable

material who accidentally received dangerous amounts of radiation.

Dr. Louis Slotin, an associate, lost his life when he accidentally let a screw driver slip from his hand as he was adjusting the distance between amounts of radioactive material. They were brought too close together and all those watching the experiment received heavy doses of gamma radiation. Dr. Slotin received around 800 roentgens, Dr. Graves reported.

The lethal dose is considered to be around 450 roentgens.

Although he was standing only one foot behind Dr. Slotin, Dr. Graves received about 200 roentgens and was hospitalized for two weeks. As a result of the accident he has lost some of the hair on one side of his head and has a radiation cataract in one eye.

atoms), is dangerous and in the long run deadly to people and other living things. This is true both for individuals living and for the future generations they beget, even if the results will be far in the future in the case of the hereditary effect.

There is little doubt the world would be a safer place for our children's children if there were less radiation from the testing of atomic bombs. This is a long-term consideration. People may live, on the average, a few days less due to atomic debris. It is more sure that it will affect the generations to come.

The radiation danger is such that no sane rulers mindful of the future of their peoples would begin an extensive atomic war which would poison the atmosphere and the earth.

As the experts testified on Capitol Hill, they talked of different time scales and from different backgrounds. Little danger today can become the high probability of death in the future.

The X-ray specialist does not hesitate to use heavy doses of irradiation or take many X-ray photographs if the patient requires it, although each exposure builds up radiation danger.

However, a more severe limitation of medical radiation than in the past is being urged by the experts.

The point of controversy between the opinions of those who favor and oppose stopping atomic testing is whether future genetic risk is worth the added assurance of atomic preparedness resulting from testing.

It is not so much a scientific question as a human and political judgment.

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CONSERVATION

Chemical Cuts Water Loss

At a time when demand for water is growing, a chemical offers a solution to water loss through evaporation, a problem faced by nations throughout the world.

► AS MUCH AS 65% of the water lost from the nation's reservoirs and lakes through evaporation might be saved by a chemical shield approximately 20 millionths of an inch thick.

A one-molecule thick coating of the chemical compound hexadecanol on the water's surface has eliminated more than two-thirds of evaporation losses in laboratory experiments conducted by the Department of the Interior's Bureau of Reclamation.

Now, Interior Secretary Fred A. Seaton has announced experiments are under way to see if hexadecanol will work on large water areas.

Rattlesnake Reservoir, near Loveland, Colo., with a surface area of 97 acres or about one-sixth of a square mile, is the site of the experiments.

There the soap flake-like particles of hexadecanol, a chemical compound found in some medicines and cosmetics, will be slowly dispersed on the water surface, forming a film that shields the water from air and sun. Even if it is 20% effective—one-third as good as laboratory results indicate—in cutting losses through evaporation, says

W. A. Dexheimer, commissioner of the reclamation bureau, the water savings would be "tremendous."

Each year the nation's reservoirs lose as much as eight feet of water because of the action of wind and sun stealing away molecules of water. While this precious water is literally disappearing into the thin air, our consumption of water grows. It is more than four times what it was in 1900. And by 1975 it is estimated we will be using twice as much as we do today.

The tests of hexadecanol at Rattlesnake Reservoir will give the reclamation scientists the information they need on just how the chemical should be dispensed over the water surface, how long it can be maintained, and how strong the layer is.

Compression of the one molecule thick layer is determined, as illustrated in the photograph below, by the spreading of drops of oil which is graded from 5 to 42 dynes pressure per centimeter. The round, doughnut-shaped container floating near the boat's bow dispenses the flake-like particles of chemical on the water's surface.

Later this summer, if the studies prove effective, full-scale monomolecular layer experiments will be held at Lake Hefner, the main reservoir for Oklahoma City, where actual measurements of reduction in evaporation losses will be made.

Hexadecanol, or cetyl alcohol, does not affect the taste or odor of water and is completely nontoxic to higher animals, the scientists report. It also has "no discernible effects on aquatic life." In one form it is used in detergents.

Research in Australia

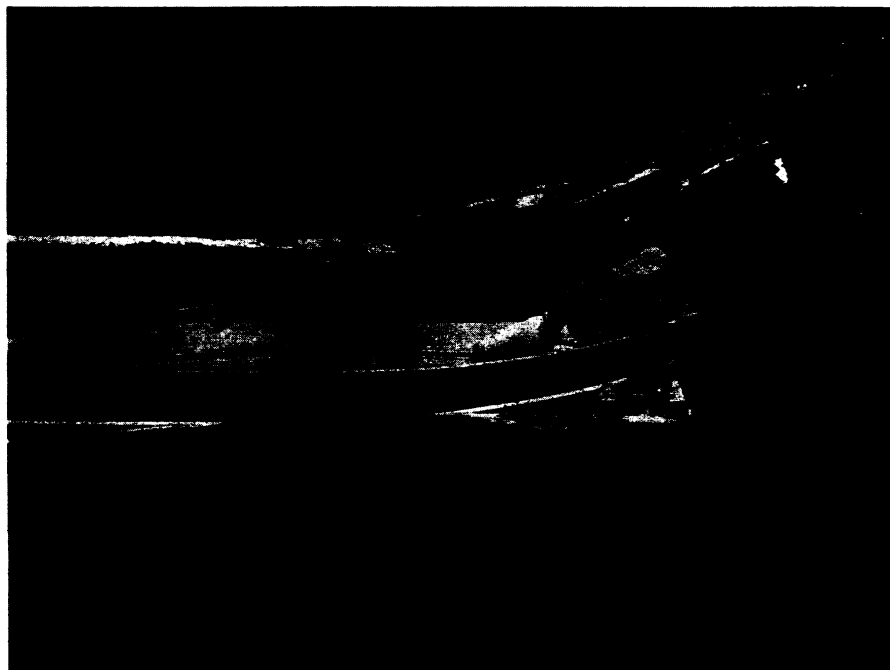
Both Australia and South Africa, in addition to private research groups here, have been conducting research on the problem of water loss through evaporation in recent years. (See SNL, December 8, 1956, p. 365.)

In a 14-week test of the effectiveness of a film of cetyl alcohol on the surface of a reservoir, Australians have reported 200,000,000 gallons of water were saved.

At a cost of approximately one penny per thousand gallons, an amount of water equivalent to six-weeks' summer consumption was saved.

W. W. Mansfield, of the industrial chemistry division of the Commonwealth Scientific and Industrial Research Organization, reports this method of conserving water would not exceed five cents per thousand gallons and the cost is much lower than that of other possible methods.

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WATER CONSERVATION—Lloyd O. Timblin, Jr., and Quentin Florey, laboratory physicists with the Bureau of Reclamation, are testing the surface film pressure of hexadecanol on the water at Rattlesnake Reservoir, Colo., by applications of oil.