BIOPHYSICS

Brain Radiation Damage

Brains of unborn babies at certain stages of early development have been found to be particularly sensitive to damage by radiation. Adults' brains more resistant.

➤ BRAINS of unborn babies would suffer most in massive radiation attacks such as A- or H-bombs. Adults on the other hand, have brains relatively resistant to radiation damage.

Non-secret research on the behavioral effects of ionizing radiations allows these conclusions.

The central nervous system of the embryo is peculiarly sensitive to X-rays and other types of ionizing radiations, particularly at certain stages of development.

The adult brain and central nervous system, however, are relatively resistant, but the effects of radiation are damaging. Adults would probably die before their brains are harmed, unless for some reason only their heads were exposed.

Several researches show that, during the earliest pre-natal period (up to seven days for the rat, roughly equivalent to three months for the human baby), the death rate is high, but the brains of survivors are usually normal.

Later (8 to 15 days for the rat, about 3 to 6 months for the human), the death rate is lower, but this is the most sensitive period for producing abnormalities. Among the defects produced are blindness, mental deficiency, microcephaly (pinheads), hydrocephaly (enlargement of the head) and other types of neural malformations. Commonest is microcephaly.

In a follow-up study made of 30 pregnant women who were exposed to radiation from the Nagasaki atomic bomb, four out of the 16 children who survived were mentally retarded.

The first attempts to find out the effects of radiation on learning were conducted in Pavlov's laboratory in Russia by Dr. M. I. Nemenow and reported as early as 1934. When the head of one dog was given a dose of 1,500 roentgens there was only a slight drop in his conditioned reflexes (primitive learning), but after an additional 2,200 roentgens, his conditioned reflexes practically disappeared.

In this country, Dr. Ernest Furchtgott of the University of Tennessee, who reviews the work in the *Psychological Bulletin* (July), found in 1951 that radiation had practically no effect on the ability of rats to run a maze. He determined radiation had little effect on the performance of animals, except for a decrease in speed and activity probably due to general radiation sickness.

A possible exception to the damaging effects of radiation is seen in a German study of 120 mental patients who were given X-ray treatment directly on the brain. Immediate effects were numbness, apathy and tingling sensations in the head, but the next day they felt happy, active and generally tranquil.

These effects were attributed to stimulation of the hypothalamus, with resulting effects on the emotions.

The biological effects of high energy radiations are due primarily to changes in the body cells through ionization, which is removal of electrons from the atoms.

The severity of the effect depends both on the total number of ions formed and on how they are distributed in the tissues. Beta and gamma rays produce from six to 11 ions per micron of tissue; 1,000 kilovolt X-rays, about 15, and those of lower voltage still more. Neutron radiation produces up to 9,000 ions per micron of tissue.

Severity of effect on mammals increases with density of the ions.

Nothing in the research reviewed by Dr. Furchtgott lends any support to the theory recently reported from England that atomic radiation increases intelligence in children.

Science News Letter, July 28, 1956

BIOPHYSICS

Nature Fortifies Against Effects of Radiation

➤ DNA, of which genes are made, is apparently well fortified against the effects of radiation.

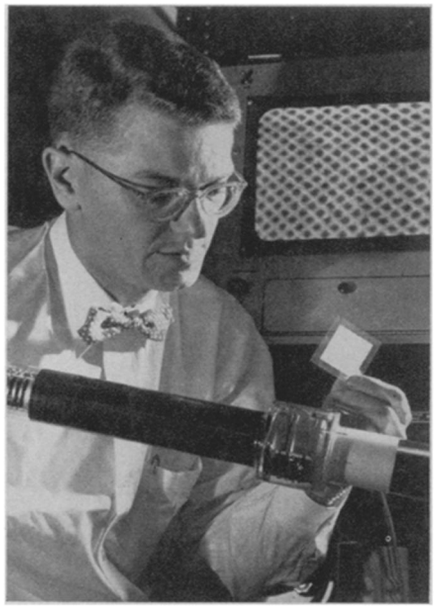
Studies at the Atomic Energy Project of the University of California at Los Angeles by Drs. Amos Norman and John Rowen have shown a considerable difference exists in the way radiation affects DNA in the test tube and in its normal cellular setting. DNA is the abbreviation for the chemical name desoxyribonucleic acid.

DNA extracted from the cell and placed in a test tube was irradiated moderately. Sensitive instruments detected marked changes in the test tube DNA molecules caused by the radiation.

Cells containing the same type of DNA were then irradiated. No changes in the DNA could be detected by the same instruments, and no effects were apparent.

It is possible the high concentration of DNA found in cells may itself serve as a protective measure. The banding together of the molecules in a tight clump may minimize damage. It is also possible DNA has been provided with a protein fortification that will ward off fairly high levels of radiation. The DNA of viruses is surrounded by a protein shell that protects it. Cellular DNA may have a similar arrangements.

Science News Letter, July 28, 1956



***HONEYCOMB FOR COMPUTER—** Dr. Harold R. Day, General Electric Research Laboratory scientist, holds a thin information storage mesh above the "reading and writing" tube in which it operates. The tiny honeycomb, with 250,000 holes per square inch, is electronically magnified on the television screen in the background.*

TECHNOLOGY

Computers Expected Using Honeycomb Device

➤ SMALLER electronic computers with larger "memories" are expected when an inch-square honeycomb device that will store up nearly a million bits of information is used.

Heart of the information storage tube, developed by Dr. Harold R. Day of General Electric Research Laboratory, Schenectady, N. Y., is a thin sheet of glass in which small holes have been etched and filled with metal. Information written onto one side of the honeycomb by an electron-beam scanning method similar to that used in television is picked up from the opposite side.

Holes in the honeycomb are 500 to the inch, so each square inch has 250,000 individual storage cells—and each cell will recognize at least 10 different levels of intensity from the writing gun.

Science News Letter, July 28, 1956

The world's deepest man-made hole reached *oil* at a depth of four and a quarter miles.

A *vapor track* can be caused by any aircraft, but is most common with jets, probably because of the higher altitude flown and colder temperatures encountered.