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BIOLOGY AND MEDICINE

RESEARCH

Biology

Cytogenetics--It was shown experimentally that subjecting grasshopper neuroblasts to hypertonic medium right after irradiation reduces the rate of reversion of the middle prophase and therefore reduces radiation-induced mitotic inhibition.

Previous work has shown that H_2O_2 is not an effective mutagen for paramecia and thus cannot be used to explain the oxygen effect and other features of X-ray mutagenesis. This conclusion was further strengthened by measurements of the catalase content and permeability of H_2O_2 of paramecia and by a repetition of certain critical experiments in which cyanide was present to inactivate catalase and insure good penetration by the H_2O_2 .

B^{10} added within spores of neurospora enhanced the lethal effect of slow-neutrons through capture irradiation. Survival of cells produced on a boron-free medium was 80 percent after a 48-hour exposure to a flux of 1.2×10^9 n/cm²-sec, whereas survival of cells from a medium containing 16 ppm of B^{10} was less than 3.7×10^{-5} . On the other hand, no difference in sensitivity was found between the cells containing natural nitrogen and those containing 65 atoms N^{15} .

Mammalian Genetics--The rate of induction of dominant lethals in mouse oocytes was measured by exposing females to 400 r of X rays and shortly after irradiation mating exposed and control females to unexposed males. The uterine contents of 76 females were examined for dead embryos and resorption sites 13-1/2 - 17-1/2 days after conception. At the same time, the number of corpora lutea in the ovaries of each of these females was recorded. Survival of embryos in the experimental group was 71 percent of that in the controls. This is approximately equal to the dominant lethal rate obtained in earlier work with similarly irradiated males.

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BIOLOGY AND MEDICINE (CONTD.)

RESEARCH--CONTD.

Radiation Protection--In a comparative study of the protective ability of β -mercaptoethylamine and mercaptoethanol, it was found that the former protects in relatively low concentrations, but comes to a relatively low plateau in protective ability. In contrast to this, mercaptoethanol requires higher concentrations and reaches its plateau at a considerably higher level of protection. There are many differences in the mechanism of protection by these compounds in spite of their close structural relation.

Biophysics--*Tradescantia* by ultraviolet irradiation were continued. Several recent experiments demonstrated that photorecovery following treatment with visible light does not occur in pollen which has been subjected to ultraviolet-produced chromosomal damage. The previous results showing no difference in the air/nitrogen breakage frequencies, as well as the time/intensity relation, have been confirmed. In addition, the "action spectrum" for chromosome breakage has been extended to an upper wave-length limit of 3600Å.

Pathology and Physiology--In a cooperative project with the Air Force, dosimetry studies, performed with the ORNL 86-Inch Cyclotron, resolved earlier discrepancies between dose measurements obtained with Victoreen chambers, Hurst-type neutron counters, fission detectors, and Failla-Rossi tissue-equivalent chambers. The energy spectrum of neutrons in the biological facility at the cyclotron was characterized experimentally and found to agree closely with that postulated theoretically.

Enzyme Chemistry--Experiments designed to identify the early products containing C^{14} from incubation of bone marrow or chick embryo with C^{14} -formate are under way. Control, irradiated, and aminopterin-treated materials are being studied. Hypoxanthine, adenine, and guanine were identified in bone-marrow extracts and hypoxanthine was found in the acid soluble material from chick embryos. Serine accounts for approximately 45-55 percent of the activity in bone-marrow acid solubles but C^{14} -serine makes up only 10 percent of the activity in similar material from chick embryos. Aminopterin inhibits serine and deoxyribonucleic-acid thymine formation about equally, while low concentrations of this radio-mimetic agent either enhance or fail to depress labeling in the purines of the ribonucleic acids.

In a continuation of the study of the production of the delayed light by green plants, it was shown that the substance responsible for the delayed light can be stored at liquid nitrogen temperatures. If a photosynthetically active green leaf is illuminated while being plunged into liquid nitrogen and then placed in the dark for several hours at liquid nitrogen temperatures, the delayed light effect is observed when the leaf is immersed in a water bath at 40°C.