AEC-NASA TECH BRIEF

Experimental Study and Evaluation of Radioprotective Drugs

A two-part study has been conducted to survey the general aspects of the testing and evaluation of radioprotective drugs and to use these testing and evaluation methods to ascertain the radioprotective effects of certain compounds administered orally and by I.V.

Interest in drugs which protect against the damaging or lethal effects of radiation is of moment because of the hazards of radiation therapy, the nuclear industry, nuclear war, and space travel. This study was concerned solely with compounds that are administered before exposure. The effectiveness of the compounds were evaluated for protection against lethal effects which occur within 30 days after irradiation.

The evaluation techniques to determine an agent's capacity to decrease an organism's sensitivity to ionizing radiation are essentially the same as those used in the evaluation of other types of drugs. Such factors as drug dosage, administration route, detoxification rate, tissue distribution, therapeutic index, time after administration, and species, strain, sex, nutrition, and environmental status of the experimental animal are common to almost all testing techniques.

Most of the techniques that are unique to the evaluation of radioprotective drugs are referable to the damaging agent, the ionizing radiation. Radiation may be of different qualities, of electromagnetic or of particle nature, in a wide variety of energies, of variable dose rates, etc. The response of the organism will, in most cases, be markedly affected by these factors of quality, energy and dose rate, and the efficacy of a protective compound will thus depend to a large extent on the nature of the radiation. Specifically studied are the sources of radiation, choice of radiation dose, choice of animals, administration of drugs, the toxicity of protective agents, and the types of protective drugs.

The remainder of the study concerned the description of experiments designed to study the effectiveness of orally administered aminothiols in lethally irradiated mice. It has been known for a long time that these drugs were radioprotective when injected intravenously, but their effectiveness after oral administration was generally reported as poor. The mice were subjected to single, total-body exposures of 775 rads of X-rays. This dose produced 100% mortality in control mice, the deaths occurring between the tenth and eighteenth day after exposure. When mice received solutions of cysteine or 2-mercaptoethylamine (MEA) in 20% gum arabic 1 hour prior to exposure, survival increased in proportion to the dose. With MEA, 100% survival occurred after 750 mg/kg; 90% survival was observed in mice pretreated with 2700 mg/kg of cysteine. These doses are 3 to 5 times as much as is required to produce the same degree of protection after intravenous injection.

Notes:

1. This study has been reported in *Methods of Evaluating Radioprotective Drugs,* by D. E. Smith and J. F. Thomson in *Methods of Drug Evaluation,* North-Holland Publishing Company (1966).
2. Inquiries concerning this innovation may be directed to:

   Office of Industrial Cooperation
   Argonne National Laboratory
   9700 South Cass Avenue
   Argonne, Illinois 60439
   Reference: B68-10320
   Source: D. E. Smith and J. F. Thomson,
   Biological and Medical Research Division
   (ARG-10196)

(continued overleaf)

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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U.S. Atomic Energy Commission
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