

A. Wayne Hawks Acting Assistant Secretary

FEDERAL RADIATION COUNCIL

THE WHITE HOUSE TODAY MADE PUBLIC THE FOLLOWING MEMORANDUM TO THE PRESIDENT FROM THE MEMBERS OF THE FEDERAL RADIATION COUNCIL. THE MEMORANDUM APPROVED RECOMMENDATIONS NUMBERED 1 THROUGH 10 OF THE MEMORANDUM FROM THE FEDERAL RADIATION COUNCIL APPROVED FEBRUARY 11, 1954.

MEMORANDUM FOR THE PRESIDENT

SUBJECT: Radiation Protection in the Federal Agency

Pursuant to Executive Order 12812, the Federal Radiation Council has made a study of the radiation and nuclear energy activities herewith transmit our first report. The report contains recommendations for the guidance of the Federal Agency in the radiation protection activities.

It is the statutory responsibility of the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the establishment of radiation standards and in the establishment of cooperative relationships and cooperation with States.

Fundamentally, setting basic radiation protection standards involves passing judgment on the extent of the possible health hazards and deciding to accept in order to realize the known benefits of radiation, which is inevitably a balancing between possible benefits, which may be foregone by foregoing any activities increasing exposure to radiation, and the promotion of the use of radiation and nuclear energy to obtain the optimum benefits.

The Federal Radiation Council has approved a study of radiation effects and consulted with scientists with regard to the radiation effects. Each member has also examined the guidance recommendations in the memorandum in light of his statutory responsibilities. The memorandum does not cover all phases of radiation protection, since as indicated above we find that the guidance which we recommend that you provide to the Federal agencies gives appropriate responsibility to the agencies for health protection and the beneficial use of radiation and nuclear energy. Our further findings and recommendations are as follows.

Discussion

The fundamental problem in establishing radiation protection guides is to allow as much of the beneficial uses of ionizing radiation as possible while assuring that man is not exposed to undue hazards. To get a true insight into the scope of the problem and the magnitude of the decisions involved, a review of the benefits and the hazards is necessary.

It is important in considering both the benefits and hazards of radiation to appreciate that man has existed throughout his history in a bath of natural radiation. This background radiation, which varies over the earth, provides a partial basis for understanding the effects of radiation on man and serves as an indicator of the ranges of radiation exposures with which the human population has developed and increased.

The Benefits of Ionizing Radiation

Radiation properly controlled is a tool for mankind. It has been of inestimable value in the diagnosis and treatment of diseases. It can provide sources of energy greater than any the world has ever had available. In industry, it is used as a tool to measure thickness, quantity or quality, to discover hidden flaws, to trace liquid flows, and for other purposes. So many uses of radiation for human benefit have been found that scientists in many diverse fields are beginning to work with the microscope in value as a working tool.

The Hazards of Ionizing Radiation

Ionizing radiation involves health hazards just as do many of the useful tools. Scientific findings concerning the biological effects of radiation of most immediate interest are the establishment of official protection standards are the following:

1. Acute doses of radiation (in the order of 100 to 600 rads) produce immediate effects, or both.
2. As acute whole body doses increase above approximately 25 rems (units of radiation dose), immediately observable effects increase in severity. At lower beginning doses, barely detectable changes in biological significance are indicating damage, to death levels of a few hundred rads.
3. Delayed effects produced by acute irradiation and chronic irradiation are similar in kind, but the ability of the body to repair radiation damage is usually more effective in the case of chronic low-dose irradiation.
4. The delayed effects from irradiation are in general indistinguishable from familiar pathological conditions usually present in the population.
5. Delayed effects include genetic effects (effects transmitted to succeeding generations), increased incidence of cancer, lifespan shortening, and growth and development effects.
6. The child, the infant, and the unborn infant appear to be more sensitive to radiation than the adult.
7. The various organs of the body differ in their sensitivity to radiation.
8. Although ionizing radiation can cause genetic and other effects (effects on the individual during his lifetime) other than genetic effects, the evidence at the present time is insufficient to justify precautionary decisions on the basis of the dose-effect relationship at low doses and doses rates. Moreover, the evidence is insufficient to prove or disprove the hypothesis of a "damage threshold" (a point below which no damage occurs) or the hypothesis of a linear relationship at low doses.

9. If one assumes a direct proportionation between biological effect and the amount of dose, it then becomes possible to relate very low dose to an assumed biological effect, though it is not detectable. It is generally agreed that an effect that may actually occur will not exceed that predicted by this assumption.

Basic Biological Assumptions

There are insufficient data to provide a firm basis for evaluating radiation effects for all types and levels of irradiation. There is particular uncertainty with respect to the biological effects of very low doses and low-dose rates. It is of prudent theory to assume that there is a level of radiation exposure below which there is absolute certainty that no effect occurs. This consideration, in addition to the adoption of the conservative hypothesis, provides a relation between biological effect and the amount of dose, and provides our basic approach to the term "radiation protection guide".

The lack of adequate scientific information makes it imperative that additional research be undertaken and new data developed to provide a firmer basis for evaluating biological risk. Appropriate Federal agencies of the Federal Radiation Regulatory Commission should be encouraging research in these areas.

Recommendations

In view of the findings summarized above, the following recommendations are made:

It is recommended that:

1. There should not be any man-made radiation exposure without the expectation of benefit. Resulting from such exposure, activities resulting in man-made radiation exposure should be limited to useful applications provided the radiation protection guidelines are followed.

It is recommended that:

2. The term "Radiation Protection Guide" be adopted for general use. This term is defined as the radiation dose which should not be exceeded without careful consideration of the reasons for doing so; every effort should be made to encourage the maintenance of radiation doses as low as is reasonably achievable.

It is recommended that:

3. The following Radiation Protection Rules be adopted for use during peacetime operations:

<u>Type of Exposure</u>	<u>Frequency</u>	<u>Limit (mR)</u>
Radiation Worker		
a) Whole body, head and trunk, active blood forming organs, gonads, or lens of eye	once a month or less	5 (max. 50 in any one year)
b) Skin of whole body and thyroid	yes or less	10
c) Hands and forearms, feet and ankles	yes or less	2
d) Bone	once a month or less	5 (max. 50 in any one year)
e) Other organs	yes or less	10

Population

a) Individual	yes	10 (max. 50 in any one year)
b) Average	50 years	1 (0.1 in 100)

(10.1)

REPRODUCED BY THE NATIONAL ARCHIVES

The following points are made in relation to the *Rad. Phys. Environ. Prot. Guides* herein provided:

- (1) For the individual in the population, the basic principle is that the whole body dose is 0.5 rem. This Guide applies when the individual whole body doses are known. As an operational technique, where the individual whole body doses are not known, a suitable sample of the exposed population should be chosen whose protection guide for annual whole body dose will be 0.17 rem per capita per year. It is emphasized that this is an operational technique which should be qualified for special situations.
- (2) Considerations of population genetics impose a per capita dose limitation for the gonads of 5 rems in 30 years. An operational mechanism is set out as a guide for the annual individual whole body dose of 0.5 rem per capita in the normal situation to assure that the gonadal exposure guide (5 rems per 30 years) is not exceeded.
- (3) These Guides do not differ substantially from certain of the recommendations such as those made by the National Commission on Radiation Protection and Measurements, the National Academy of Sciences, and the International Commission on Radiological Protection.
- (4) The term "maximum permissible dose" is used by the National Committee on Radiation Protection (NCRP) and the International Commission on Radiological Protection (ICRP). However, this term is to be understood in the words "maximum" and "permissible" both have unfortunate connotations not intended by either NCRP or ICRP.
- (5) There can be no single permissible or acceptable level of exposure without regard to the reason for permitting the exposure. It should be general practice to avoid exposure to radiation, and positive efforts should be carried out to fulfill the sense of these recommendations. It is recognized that exposure to radiation sometimes is deemed to be a condition of its necessity.

- (6) There can be different Radioactivity Concentration Guides for different numerical values depending upon the circumstances. The Guides herein recommend that the appropriate Guides be used for peacetime operations.
- (7) These Guides are not intended to apply to radiations exposure resulting from natural background, and the purpose of the Guides is the protection of patients by practitioners of the healing arts.
- (8) It is recognized that our present scientific knowledge does not provide a firm foundation with sufficient data for the selection of any particular numerical value in preference to any other value. It should be recognized that the Radioactivity Protection Guides herein recommended are based upon the level where biological effects are not demonstrable.

It is recommended that:

- 4. Current protection guides used by the agencies be adopted on an interim basis for organ dose to the population.

Recommendations are not made regarding the Radioactivity Protection Guides for individual organ doses to the population, other than the above. Unfortunately, the complexities of establishing guides applicable to the radiation exposure of all body organs preclude the formulation of any recommendations concerning them at this time. However, the Radioactivity Protection Guides used by the agencies are adopted on an interim basis.

It is recommended that:

- 5. The term "Radioactivity Concentration Guide" be adopted for Federal use. This term is defined as the maximum level of radioactivity in the environment which is determined to result in body or organ doses equal to the Radioactivity Concentration Guide.

Within this definition, Radioactivity Concentration Guides are determined after the Radiation Protection factors are determined. Any given Radioactivity Concentration Guide is applicable only under the circumstances under which the value of the corresponding Radioactivity Protection Guide is appropriate.

REPRODUCTION BY THE PUBLIC IS PROHIBITED

It is recommended that:

6. The Federal agencies, as an interim measure, use radioactivity concentration guides which are consistent with the recommendations of the Radiation Protection Guides. Where no Radiation Protection Guides are provided, Federal agencies are to use presently available

No specific numerical recommendations for Radioactivity Concentration Guides are provided at this time. However, concentration guides now used by the agencies appear appropriate on an interim basis. Where appropriate radioactivity concentration guides are not available and where Radiation Protection Guides for specific organs are provided herein, the latter Guides can be used by the Federal agencies as a starting point for the derivation of radioactivity concentration guides applicable to their particular problems. The Federal Government has also initiated action directed toward the development of the Guides for radiation protection.

It is recommended that:

7. The Federal agencies apply these Radiation Protection Guidelines with judgment and discretion, to assure that reasonable probabilities are achieved in the attainment of the higher goal of protection from the undesirable effects of radiation. The Guidelines are not to be exceeded only after the Federal agency having jurisdiction over the matter has carefully considered the reasons therefor in light of the recommendations of the Guidelines.

The Radiation Protection Guides provide a general framework for the radiation protection requirements. It is expected that each Federal agency, by virtue of its immediate knowledge of its operations, will use these Guides as a basis upon which to develop detailed requirements tailored to meet its particular requirements. The Federal Government will coordinate the activities of the Federal agencies in this area and will provide the necessary coordination to achieve the radiation protection program.

If the foregoing recommendations are approved by the Commission, the guidance of Federal agencies in the conduct of their radiation protection activities, it is further recommended that the Commission publish the Guidelines in the Federal Register.

Approved: _____
Director, Federal Bureau of Investigation

The recommendations numbered 111 through 177 contained in the above memorandum are approved for the guidance of Federal agencies, and the memorandum shall be published in the Federal Register.

APPROVED AND FORWARDED:

May 11, 1967

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