

**Proposal**  
**To**  
**U.S. Nuclear Regulatory Commission**  
**to produce an NCRP report on the**  
**Critical Evaluation of the Linear— No Threshold Assumption**  
**April 1, 1996 to March 31, 1996**

**National Council on Radiation Protection and Measurements**  
**7910 Woodmont Avenue, Suite 800**  
**Bethesda, Maryland 20814**

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## TECHNICAL PROPOSAL SUMMARY

Submitted by: National Council on Radiation Protection and  
Measurements  
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Type of Organization: A non-government, not-for-profit, congressionally  
chartered, public service, scientific and educational  
organization

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Cost: \$225,000, \$75,000 per year for  
three years

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Date of Submission: February 10, 1996

## Objective<sup>1</sup>

The objective is to make a critical scientific assessment of all biological studies of the effects of ionizing radiation, and radiobiological theory of effects, in the low-dose and dose-rate region, *e.g.*, less than approximately 200 mSv and 10 mSv h<sup>-1</sup> and then to summarize these effects.

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<sup>1</sup>The NCRP is imminently qualified to perform this study as it has among its membership national experts in many fields to carry out its broad program in radiation protection and it can assemble the best scientific minds of national stature to serve on the committee to perform this assessment. In addition, the NCRP has the responsibility to meet the objectives of this study as given in its charter, see page seven. No other organization in the United States has this specific responsibility in its charter.

## Rationale/Task<sup>2</sup>

Those responsible for establishing limits of radiation exposure for radiation protection purposes have assumed that at the low levels of dose relevant to radiation protection activities, the response of humans, as far as cancer induction or hereditary effects is concerned, is linear with no threshold. It has always been recognized, however, that this is an assumption and not a fact directly demonstrated by human epidemiological data nor uniformly supported by other biological data or theory.

Because the assumption of linearity plays such a vital role in our systems of radiation protection, both as a means of employing information available from human exposures at high doses and from a practical standpoint in facilitating exposure control, a critical examination of the scientific support, or lack thereof, for the assumption is warranted. The report to be prepared is aimed at such an examination.

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) has published two reports of particular relevance to this examination. Annex E of their 1993 report (UNSCEAR, 1993) reviews mechanisms of radiation carcinogenesis at low dose and low-dose rate. Their 1994 report (UNSCEAR, 1994) contains a section on low-dose epidemiology and a section on adaptive response. These reports, particularly the 1994 report,

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<sup>2</sup> A study by the NCRP addressing this subject is timely in that there is considerable discussion taking place currently in the radiation protection community on adaptive response and radiation effects in general at low dose. This committee is not expected to specifically address risk estimates such as those derived from the survivors of Hiroshima and Nagasaki nor are they expected to specifically address the uncertainties in those estimates. However, the committee will perform a thorough assessment of the available information on radiation effects at low dose.

have raised questions of hormesis to the level of in-depth scientific analysis and will form an important aspect of the committee's reference material. The committee will also review the experimental data and the radiobiological theories of scientists who have varying opinions and theories on the response of biological systems to ionizing radiation in the low dose region.

It may be possible that definitive guidance on specific radiation protection assumptions at low dose could result, but a detailed exposition of what is known about the subject will, in and of itself, prove to be of major importance to all who have responsibilities that relate to radiation protection.

With the availability of funding, the NCRP will establish a scientific committee of national experts to conduct this assessment. It is anticipated that such a scientific committee would be comprised of recognized individuals with expertise in the scientific areas such as biophysics, genetics, DNA repair, experimental animal oncogenesis, dosimetry, radiation epidemiology, as well as operational radiation protection. It is anticipated that an additional 10 to 15 scientists with diverse opinion on the effects of ionizing radiation at low dose will be asked to present their views to the committee and to, therefore, serve as consultants to the committee. The consultants would not regularly attend meetings, but would most likely attend one meeting and have the opportunity to review the committee's report as it is developed. It may be effective to conduct a one or one and one-half day seminar where the consultants would be invited to present their views to the committee.

Such a committee would be expected to meet six to eight times during a three year period. The estimated cost of travel and secretariat support for such a committee is \$75,000 annually. (A detailed budget will be provided on request).