



Health Effects of Low-Level Radiation

Background Information June 2001

BACKGROUND

The Linear No Threshold Hypothesis (LNTH) is the current basis for regulation of low levels of radiation in the United States. Under this hypothesis, the effects of low-level radiation are assumed to be deleterious. This hypothesis presumes that detrimental health effects are linearly proportional to radiation dose down to zero dose. It assumes that any exposure, no matter how small, increases detrimental health effects. A corollary to the LNTH is the collective-dose theory, which assumes that small doses to large populations can be added up to predict a large number of statistical health effects.

Scientists and researchers, as described in the following paragraphs, are increasingly questioning the validity of the LNTH and the collective dose theory and their application in the regulation of the potential health effects of low-level radiation. If the LNTH is not valid, significant benefits can accrue to society by developing a valid science-based standard for assuring public health. These benefits include an increased public confidence in medical, industrial, food safety, and energy applications of nuclear science and technology and may include reduced societal costs in regulating and controlling radioactive material.

Since 1994, the ANS has sponsored numerous technical sessions on this topic at its national meetings with many distinguished internationally recognized panelists. The objective of these technical sessions was to establish a firm basis for re-evaluating the health effects of exposures to low-levels of radiation. There were two significant conclusions resulting from these sessions:

1. There does not appear to be good scientific evidence supporting a linear no threshold hypothesis (LNTH) at low-levels of radiation exposure; and
2. A complete review of past studies (both published and unpublished) and the conduct of new studies are needed to confirm or refute the LNTH hypothesis.

Congress has passed legislation authorizing the study by the Department of Energy, of health effects of low-level radiation. The overriding goal of this study must be to ensure that human health is adequately protected. In light of this activity, the ANS has developed a position and recommendation, as follows:



ANS POSITION AND RECOMMENDATIONS

It is the position of the American Nuclear Society that there is insufficient scientific evidence to support the use of the Linear No Threshold Hypothesis (LNTH) in the projection of the health effects of low-level radiation. Given this situation, an independent group of reputable scientists, medical experts and health researchers should be established to conduct an open scientific review of all data and analyses on the subject of LNTH. The purpose of the review is to determine whether the reported conclusions on radiation health effects at low doses are supported by valid data. ANS recommends that this review be led by a nationally respected medical or health expert not previously connected with this issue. This review should, in a timely fashion, examine the existing data and analyses (published and unpublished). Based on the conclusions of this review group, a separate group composed of stakeholders should make recommendations on whether adjustments to current radiation protection guidelines should be made immediately to reflect current information.

In addition, it is the ANS position that new research on low-level radiation health effects, spanning several disciplines, should be initiated. Meritorious existing research within the disciplines should continue to receive funding. Such research includes epidemiology of exposed human populations, research involving protracted exposure in animals, cellular and molecular biology, dose assessments and measurements, and policy analysis relating to regulation in the presence of small risks.

The following question needs to be answered:

Are there radiation doses or dose rates below which there is no significant biological change or below which the damage induced is effectively controlled, from a human health perspective, by normal cellular processes?

In addition, the ANS recommends that the funding allocated for research on health effects of low-level radiation should be directed to accomplish the following activities:

1. Conduct follow-up research and analysis based on a review of the data discussed above, where warranted.
2. Attract researchers to the field to form multidisciplinary teams with individuals who have strong qualifications in their respective fields of expertise.
3. Conduct new research and continue meritorious existing research in a variety of disciplines. The research should be directed at:
 - Development of a scientifically based model that may be applied to determine the presence or absence of positive or adverse health effects due to low-level radiation exposure.
 - Improvement of the estimates of radiation risks and characterization of the uncertainties inherent in these estimates.



- Finding appropriate regulatory approaches based on both the magnitude and shape of the dose effects curves and their uncertainties.

The review and research described above will develop a scientific basis for the health effects of low-level radiation on which most scientists agree. It is important to enlist stakeholders and policy makers in this process so that they will develop a good understanding of the underlying science and its implications and confidence in the results. Finally, communicating to the public is essential so that they also will have confidence that the underlying science of radiation protection policy is reasonable and appropriate.

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