"Comments on Estimating Risks of Low Radiation Doses – A Critical Review of the BEIR VII Report and Its Use of the Linear No-Threshold (LNT) Hypothesis by Edward J. Calabrese and Michael K. O'Connor"

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Explanation

Recently a Commentary by Calabrese and O'Connor was published in the journal Radiation Research, criticizing the use of the linear, non-threshold (LNT) model of ionizing-radiation dose-response in a major publication of the U.S. National Academies of Science (NAS). RERF scientists joined a staff member from NAS in responding to this commentary, which contained a number of factual inaccuracies and misleading assertions.

For many years there has been controversy in the worldwide radiation protection community about the model to be used in relating the excess risk of cancer or other radiation-related adverse health outcomes to the radiation dose received by an exposed person. A model often used by standards-setting and advisory bodies is the LNT model, which is based on the idea that the excess risk is proportional to the dose, at all dose levels. The NAS Committee on the Biological Effects of Ionizing Radiation (BEIR), in its BEIR VII Phase 2 Report issued in 2006, defended and relied upon the LNT model. This model is often criticized by those who contend that there is a threshold dose beneath which there is no excess risk, or that low doses of radiation actually reduce the risk below the level at zero dose, by stimulating the exposed person's body in some beneficial way (hormesis).

RERF does not take any official position on the LNT model, and RERF scientists use both the LNT and other models in their publications. Because RERF scientists were conversant with many of the issues involved and serve as advisors to NAS committees and other advisory bodies related to the health effects of ionizing radiation, they could help in responding to criticisms leveled by (C&O) against the NAS committee's use of LNT. The authors of the letter addressed a long list of concerns about the C&O Commentary, including 1) inaccurate assertions about the historical origins of the LNT model in NAS work, 2) a suggestion that the NAS BEIR VII Committee relied on tradition instead of conducting a new and thorough analysis, 3) assertions (inconsistent with the preceding ideas) that because the recommendations of NAS committees have changed somewhat over the decades, they are therefore somehow unreliable, 4) reliance on selected data to support criticism of the LNT model, 5) reliance on the visual appearance of plots to make statements that should be based on statistical model-fitting,

parameter estimation, and hypothesis testing, and 6) an assertion that that the use of a dose- and dose-rate effectiveness factor (DDREF) in the BEIR VII risk model somehow invalidates the LNT model in the low-dose range. These are just a few of the points in the NAS/RERF response to C&O's Commentary, both of which the reader is encouraged to consult for more detail.

The Radiation Effects Research Foundation has studied A-bomb survivors and their offspring in Hiroshima and Nagasaki for more than 60 years. RERF's research achievements are considered the principal scientific basis for radiation risk assessment by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and for recommendations regarding radiation protection standards by the International Commission on Radiological Protection (ICRP). RERF expresses its profound gratitude to the A-bomb survivors and survivors' offspring for their cooperation in our studies.

[§]*Radiation Research,* which is an official monthly journal of the Radiation Research Society, publishes original, peer-reviewed papers and review articles on radiation effects and related issues in the fields of physics, chemistry, biology, and medicine. (Impact factor in 2014: 2.911)