**An ANS Grand Challenge: Revise Low Level Radiation Exposure Standards**

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The commercial nuclear technology profession is not substantially different from any other large-scale industrial endeavor, except for one thing: ***Radiation***.

It is harnessed radiation that has delivered incredible contributions to modern life –including major advancements in agriculture, medicine, electricity production, modern industry, transportation, space exploration, public safety, arts and sciences, and environmental protection.(1)

Unfortunately, the very mention of the word “***radiation***” sends chills up the backs of far too many members of the public, along with many policy makers. Unless this unsubstantiated fear can be overcome, it is an ominous signal that the enormous benefits of nuclear technology could be denied to future generations.

The radiation health community has long known that high levels of radiation can cause considerable bodily harm—even death if the radiation is delivered at a sufficiently high dose. However, there is increasing controversy on the human health effects of low level radiation—dose levels in the natural background range, possibly up to 100 mSv or higher. For regulatory purposes, the Linear Non-Threshold (LNT) model is currently being used, implying that damage to the human body could occur even down to essentially a zero dose. This model was adopted over 50 years ago, not based on solid science but because it was considered conservative. Having been educated in the nuclear engineering profession, we respected this approach as acceptable during our early years because we felt we could live with this “conservative” approach.

We began to seriously question the validity of this model in the wake of the Chernobyl accident, when the post-accident analyses revealed a far lower number of deaths or illnesses resulting from the released radioactivity than would have been expected by using the LNT model. But the accident at Fukushima convinced us that a major revision of our approach to low-level radiation must be achieved. Most of us professionals now know that despite the international media outrage following the March 11, 2011 East Japan earthquake and resulting tsunami, where some 1600 deaths were reported resulting from the evacuation, the number of deaths due to radiation exposure was ZERO!(2,3) The deaths were due to displacement (mainly resulting from stress, grieving, insomnia, depression, anger, alcoholism, etc.).

It then became clear that the “conservative” approach, which led to some 16,000 people being evacuated due to the fear of radiation exposure, actually resulted in a great many deaths and considerable agony to those still surviving—NOT because of any real damage due to the radiation itself. Clearly, there is an *ethical* need to re-examine the basis for the LNT model, including a hard look at mounting evidence that there may be actual beneficial health effects at these low levels.(4,5)

In addition to the unjustified and demonstrably harmful effects on human health noted above due to applying radiation regulations based on the LNT model, there are unreasonable cost impacts this model supports which continue to cripple the nuclear industry and, by extension, unnecessarily burden the taxpayer. Examples of such costs can be found throughout the nuclear fuel cycle, including nuclear operations, nuclear reactor design, nuclear accidents, nuclear waste disposal, and nuclear medicine. (6)

During recent years, compensation programs in the U.S. have expended in excess of ten billion dollars for awards to employees of nuclear facilities for illnesses alleged to be radiation induced. Many of the recipients had no record of measurable exposure but had been employed on a site where radioactive materials were handled. This is but one example of where the unjustified fear of low-level radiation, resulting from employing the “conservative “approach, has inflicted huge costs without scientific justification.

Considerable attention has been mounting over the past several decades to remedy the effects of continuing to use the LNT model in setting international standards for radiation dose effects to humans. A recent poll of ANS members to gather input on this issue was reported on page 9 in the January/February 2017 issue of ANS news. Over75 percent of ANS members who responded to the survey think that current regulations on low-dose radiation are inconsistent with scientific evidence and need to be revised. Over 90 percent feel that ANS should play a role in changing regulations and standards.

Fortunately, the American Nuclear Society has already teamed with the Heath Physics Society to sponsor a Joint Topical Meeting entitled “*Applicability of Radiation-Response Models to Low Dose Protection Standards*,” scheduled for September 23-26, 2018 in Tri-Cities, Washington.

This conference is designed as a platform for key decision-makers of the international science community to pursue a constructive, full-scale re-evaluation of the current regulatory approach to low-level radiation exposure. A colloquium of this significance could, ideally, develop a new paradigm based on the best available science. Achieving such a successful result could easily be the determining factor to the future of our technology, our profession, and the opportunities available to 21st century civilization.

References:

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5. Ludwig Feinendegen, Myron Pollycove, and Ronald Neumann, “**Hormesis by Low Dose Radiation Effects: Low-Dose Caner Risk Modeling Must Recognize Up-Regulation of Protection,”** Dose-Response Journal, June 2010.
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