

(March 3, 2017)

Scott Pruitt, Administrator  
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**Subject: Establishing Scientific Bases for Risk-Based Radiation Regulations**

We, the undersigned U.S. and International members of **Scientists for Accurate Radiation Information (SARI)** ([radiationeffects.org](http://radiationeffects.org)), hereby petition your Agency to revise the bases of risk-based radiation regulations so as to ensure their foundations are based on sound science to best protect human health and the environment. Currently, they are based on the outdated and demonstrably false Linear No-Threshold model (LNT) rather than on more recent evidence-based science<sup>(1, 2, 3, 4)</sup>. Though initially proposed for radiation safety, the LNT model has crept into use as a basis for determining environmental and clean-up levels for many regulated chemicals, without adequately framing the policies on the best available science<sup>(5)</sup>.

The data from the Japan atomic-bomb long term survivor study were analyzed by Ozasa<sup>(6)</sup> et al., who performed a dose-threshold analysis using the RERF Life Span Study "gold standard" database and concluded that zero dose is the best estimate of the threshold dose. Their analysis was flawed, since it used a restricted functional form for dose response that did not cover the full range of the observed data nor other possible functional forms that better fit the data. Analysis with a more general functional form has shown that a non-zero dose threshold cannot be excluded, and is more likely consistent with the data<sup>(7,8)</sup>. Further, RERF itself, in its Report 4-15, showed a new analysis which concluded: "In analysis of the LSS data, compared to the conventional Linear No-Threshold model, the proposed approach estimated smaller risks with wider interval estimates at low doses, which indicated no clear evidence of an increased risk up to 100 mGy of exposure." Thus, the Hiroshima survivor data do not lead to the conclusion of zero dose threshold, contrary to the claim by Ozasa et al.

Accordingly, we believe the EPA should reconsider its antiquated radiation policies based on old science and update its policy to be more consistent with the latest science, and eliminate regulations using LNT and its derivative, the As Low As Reasonably Achievable (ALARA) rule.

We were recently instrumental in petitioning the Nuclear Regulatory Commission to similarly revise their regulations in 10 CFR Part 20 that are based on LNT. These petitions [Docket Nos. [PRM-20-28](#), [PRM-20-29](#), and [PRM-20-30](#); plus [NRC-2015-0057](#)] are currently under review.

Unintended and unanticipated consequences of the mistakenly assumed "conservative" approach to risk assessment have led to the following:

- Casualties in Fukushima: Urgent evacuation of the Fukushima area and its prolongation following the 2011 nuclear power plant accidents caused more than 1,650 deaths with no recognizable benefit. More than 100,000 people remain displaced for no reason.<sup>(9)</sup> There were no radiation casualties from the Fukushima accidents, even under almost unimaginable damage conditions.
- Higher costs: Ratcheting up of onerous regulations against the various uses of radiation (medical, industrial, nuclear energy, etc.) has resulted in tremendously increased costs, but no benefit.

- Suppression of nuclear energy: The use of nuclear energy to produce electricity, though it has proven the safest in terms of fatalities per amount of energy produced, has been competitively disadvantaged by low-dose-radiation-induced radiophobia and burdensome regulations arising from LNT. This has resulted in real casualties from other non-nuclear energy sources. For example, a recent natural gas explosion in local supply lines in Harlem, NY, killed 8 people and injured 70. The use of nuclear energy in lieu of gas might have prevented these casualties.
- Missed diagnoses: Many patients and doctors are now reluctant to use adequate radiation strength for proper CT scans, resulting in scans having poor image quality and making it harder to accurately read the images, all to the patients' detriment. More distressing yet, many patients refuse to undergo or allow their children to undergo medically indicated CT scans.
- Suppression of research on cancer, Alzheimer's disease, etc.: There is considerable evidence supporting the use of low-dose radiation to stimulate cancer prevention, and even an early, anecdotal suggestion that it might alleviate other major diseases like Alzheimer's. The use of the LNT model unnecessarily inhibits testing such applications. According to a conservative estimate, about 10% of current deaths from cancer can be prevented using low-dose radiation. Considering the annual worldwide cancer death toll of 7.6 million, the LNT model may be responsible for over 2,000 otherwise preventable cancer deaths every day, worldwide<sup>(10)</sup>.

**Why the LNT model was adopted:** The LNT model was initially adopted by the Genetics Panel of the National Academy of Sciences (NAS) Biological Effects of Atomic Radiation (BEAR) I Committee in 1956. Its summary report made statements such as: *"Even very small amounts of radiation unquestionably have the power to injure the hereditary materials"* and *"there is no such figure other than zero"* (for amount of radiation that is genetically harmless). The full report was published in the *New York Times* and received huge publicity, greatly increasing and generalizing the fear of low-dose radiation.

A year later, letters exchanged among the committee members included statements such as: *"I, myself, have a hard time keeping a straight face when there is talk about genetic deaths and the tremendous dangers of irradiation"*; *"Let us be honest with ourselves—we are both interested in genetics research, and for the sake of it, we are willing to stretch a point when necessary"*; and *"Now, the business of genetic effects of atomic energy has produced a public scare, and a consequent interest in and recognition of importance of genetics. This is to the good, since it will make some people read up on genetics who would not have done so otherwise, and it may lead to the powers-that-be giving money for genetic research which they would not give otherwise."*<sup>(11)</sup> These committee-member exchanges are highly informative, demonstrating that the adoption of the LNT model was not about any putative danger of low-dose radiation, but rather supportive of their own self-interests.

**Why the LNT model persists:** The LNT model has resulted in financial support for the advisory committees (such as the ICRP, NCRP, etc.) and other individuals and organizations that cater to public fears in an amplifying and self-fulfilling feedback loop. Considering the dubious reason for the initial adoption of the LNT model (i.e., self-interest of committee members), similar motivation for its continuation cannot be ruled out. As evidence, the advisory committees have failed to allay concerns about low-dose radiation even after observing the above-mentioned negative impacts (and no benefit) from the use of the LNT model, and in spite of the evidence for the cancer-preventive effect of low-dose radiation, which they continue to ignore. Self-interest is still manifest, and they will not voluntarily discontinue use of LNT.

One might ask: if there is compelling evidence against the LNT model and the advisory bodies have ignored it, why don't scientists point this out, and push the advisory bodies to do the right thing? In

fact, many scientists have done this, but their writings get ignored or dismissed by the advisory committees. Such writings also receive little coverage by popular media as they are not sensational, in contrast to the advisory committee reports and articles that claim cancers from the smallest amounts of radiation.

**Why it is important to abandon the unscientific LNT model:**

- The LNT model is not justifiable as it is based on the disproven concepts: even a small amount of radiation increases mutations, and mutations cause cancer.
- The somatic mutation model of cancer is not valid, as it completely ignores the role of the immune system in removing cancerous cells. Low-dose radiation does not increase but decreases overall mutations because of the biological adaptive response of increased defenses.
- Suppression of the immune system contributes to the appearance of cancer. Low-dose radiation boosts the immune system, and so would reduce cancers.
- There is plenty of evidence for a threshold or radiation hormesis (beneficial effect) and against the LNT model, including the Life Span Study data and radon versus lung cancer data.
- Publications supporting the LNT model have been shown to contain major scientific flaws, as shown herein.
- There have been many major adverse consequences from the application of the LNT model that have been detrimental to human health and the environment.

**Conclusions:**

LNT-based radiophobia fuels needless evacuations, results in extraordinary environmental cleanup costs, inspires avoidance of life-saving medical procedures, produces pressure to lower the diagnostic quality of radiation-related medical imaging, and promotes nuclear fear. Considerations of the basic sciences of biology, physics, chemistry, and other natural sciences should be either the source or the final arbiter of scientific hypotheses about ionizing radiation. Epidemiological studies that identify associations with disease do not prove causation. Many of the key studies often referenced in support of the LNT suffer scientific flaws<sup>(1)</sup>, that ignore the manifold findings of those basic sciences and make their conclusions based on the precautionary principle (rather than the precautionary approach) that radiation exposure must be proven safe for it to be considered safe. This is an impossible task and not consistent with sound scientific principles. . Failure to take proven biological reality into account leads to counterproductive statistical exercises, sometimes fraught with numerous errors. It further leads to the appearance of erudition purely through mathematical complexity. These studies are not benign; they do not err on the safe side; and they have deadly consequences.

Thus, we ask that the EPA's risk-based radiation regulations be revised as above, as soon as possible.

Sincerely yours,  
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Note: All signers of this Memo are members or associate members of SARI (Scientists for Accurate Radiation Information, <http://radiationeffects.org/>). The above Comment represents the professional opinions of the signers, and does not necessarily represent the views of their affiliated institutions.

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