EDITORIAL—When scientists fail at science: Why low-dose radiation exposure is not to be feared



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*The following op-ed was rejected by a popular physics journal and seven of the country’s leading newspapers, including The New York Times, Wall Street Journal, USA Today, Washington Post, and LA Times. It is at least as important to know that the mass media, with the notable exception of our own Green Valley News, generally refuse to acknowledge that, for the better part of a century, the science of radiation biology has been corrupted by special interests, such as self-perpetuating regulatory agencies and certain radiologists whose reputation rests on being harbingers of doom and protectors of the populace. This has caused untold harm to hundreds of thousands of people, who have suffered from unwarranted forced evacuations near nuclear power plant accidents and fear-driven refusal to have necessary and potentially life-saving X-rays and CT scans.*

*As a radiologist (now retired), Dr. Bill Sacks was trained to fear low-dose radiation, until he began to study the issue some years ago. It is no wonder that so many people outside the field also fear exposure to medical imaging studies and nuclear energy. But the good news is that the fear is entirely misplaced. Natural background radiation from ground and sky far outweigh exposures from medical imaging and nuclear power plants (even after accidents). Furthermore, damage from everyone’s normal metabolic processes outweigh that from natural background by factors of a few million(!). As a result, all plants, animals, and bacteria have evolved repair and defense mechanisms that protect us from radiation damage at these low exposures (though much higher exposures most assuredly sicken and kill). And a growing number of scientists, including the authors of this op-ed, are now trying to protect us from those regulatory agencies, and others, who refuse to admit the truth.*

Scientific achievement displays a muddled, disordered topography, with landscapes of wonderful pinnacles, but deep, mysterious crevices denoting failure.

We examine one such crevice that remains uncorrected: the linear no-threshold (LNT) model of radiation-induced cancer, relied upon by governments and advisory bodies as the basis of regulatory policy for 70 years. High-dose radiation can cause cancer, but this has never been shown at low doses in the range of X-ray and computed tomography (CT) examinations or in the vicinity of nuclear power plants.

The proven consequence of high doses has simply been assumed to apply even near zero dose, with no threshold below which it is harmless, producing predictions of cancer at all doses. But the body responds differently to radiation at high and low doses, as proven in many studies: at low doses the body eliminates the damage through a variety of protective mechanisms, evolved in humans from eons of living in a world bathed in slowly delivered but sometimes high-dose natural radiation.

Based on the unwarranted fear of cancer, residents were evacuated from around the Fukushima nuclear plant rather than being sheltered in place, resulting in more than 1,600 deaths. Simple sheltering would have saved many lives. Recently, the Japanese Cabinet has decided to lift evacuation orders; whether residents will actually return is uncertain due to the radiophobia instilled in them over the past four years. Reliance on the LNT model has resulted in even larger health and economic impacts at Chernobyl. All such devastating results of the LNT model have prompted three recent petitions to the US Nuclear Regulatory Commission to reject this falsehood. Let’s examine how the original formulation of this fear-inducing LNT model came into being.

**Fruit fly mutations**

Nobelist Hermann Muller, a founding proponent of the LNT model, investigated X-ray effects on fruit fly gene mutations. By the 1940s, emphasized in his 1946 Nobel lecture, he claimed the mutation rate was a linear function of dose down to zero, independent of dose rate, with no threshold below which there is no effect. Muller based his claim upon testing at doses that are quite high (at least 4,000 mGy). (For comparison, U.S. natural radiation exposure averages 3 mGy annually, and a typical CT scan is 10 mGy.) Thus, Muller’s claim of harm down to zero dose was a fiction posing as science.

In 1948-9, Muller’s colleagues’ research found that below 500 mGy flies often had similar or even lower mutation rates than unirradiated flies, especially when dose rate was low enough, suggesting protective responses and a no-harm threshold somewhere below 500 mGy. Some of their results were inconsistent, but rather than continue testing, they arbitrarily and unjustifiably decided that there was no threshold and that dose rate was irrelevant, reinforcing Muller’s false claim.

Fortunately, these researchers left a trail of published data that, when examined today, does confirm a threshold, contrary to their claim. Apparently this result was neither noticed by these investigators nor by any others, until recently discovered by us.

Muller’s and colleagues’ fictions survive in the LNT model of today, which says that low-dose radiation increases cancer risk. However, while linearity — the “L” in LNT — was demonstrated at doses considered high today (not down to zero dose), the absence of a threshold has never been demonstrated. The only scientific conclusion from the data of 1949 through today is that the LT (linear threshold), not LNT (linear no-threshold), model is correct, with a threshold at low-doses below which radiation is harmless. Even atomic-bomb survivor research (the gold-standard of dose-response data) does not support the LNT model; adaptive protections mitigate radiation-induced damage at low doses/dose rates. No epidemiological studies have ever demonstrated a causal relationship between low-dose radiation exposure and carcinogenesis.

Many, while admitting this absence of evidence, nevertheless believe LNT model-derived “precautions” save lives. But misguided regulation/policy applications of LNT-based hypothetical harm have themselves caused death and psychological damage from unnecessary evacuations following the Chernobyl and Fukushima events, and adverse health consequences from patients’ fear-driven rejection of potentially life-saving X-rays and CTs. Additionally, hundreds of billions of dollars are wasted due to unwarranted fear of low-dose radiation.

Scientists have failed with regard to the science of radiation protection. Unless the accurate LT model, showing no harm from low-dose/dose-rate radiation below thresholds, becomes the basis of radiation regulation, the public will remain exposed to the LNT threat. Science must finally arrive at summary judgment that the LNT model is pure fallacy, thereby alleviating suffering and abating needless, paralyzing public fear. The LT relationship’s threshold with no low-dose radiation harm can free people from the grip of groundless phobias: no harm, no fear.

*Jeffry A. Siegel, Charles W. Pennington and Bill Sacks belong to Scientists for Accurate Radiation Information (SARI – www.radiationeffects.org). SARI’s members come from 14 countries and are organized around the effort to address what they consider foundational fallacies surrounding radiation that create phobic responses to nuclear energy. Sacks lives in Green Valley.*