



Why Japan's response to Fukushima radiation failed while Utah's response succeeded

By James Conca

In 1953, the United States detonated aboveground nuclear weapons during tests at the Nevada Test Site. In 2011, the Fukushima Daiichi meltdown occurred in Japan. Both events spread radioactive material over many miles and over population centers. Neither event resulted in any adverse health effects from that radiation.

But the response to the Fukushima event was disastrous because of the irrational and misinformed fear of radiation. That fear—not radiation—killed at least 1,600 people and destroyed the lives of at least another 200,000. That fear seriously harmed the entire economy of Japan, stopped cold the fishing industry and other agriculture in that area, and, overnight, reversed the country's progress in addressing climate change.

The U.S. tests spread two to three times more radiation than did the events of Fukushima over the people of Utah, particularly the town of St. George. Like with Fukushima, no one was hurt, there was never any increase in cancer rates, and no one died as a result. But in Utah, the economy and people's lives were unaffected. Why was there such a different result?

The answer is obvious to famous radiobiologist Dr. Antone Brooks. In the 2020 article for the *International Journal of Radiation Biology*, "Cost of fear and radiation protection actions: Washington County, Utah and Fukushima, Japan," Brooks and his coauthor, Bruce Church, compared the effects of radioactive fallout from 1953 atomic bomb testing in Washington County, Utah, to that of the Fukushima accident.

Even after receiving much higher radiation doses than those in Japan, the city of St. George, Utah, asked the people to simply shelter in place for a while. No other action was taken, although people washed off their cars right afterward. There were no health effects. Cancer rates in Washington County have always been among the lowest in Utah, which has the lowest cancer rates in the entire United States. Hundreds of similar tests occurred over many years, with similar



Aboveground atomic bomb test at the Nevada Test Site while troops look on. These clouds of material often wafted over to Utah during the 1950s. (Photo: NNSA)



actions (or inactions, as the case may be) taken by the population, and with similar end results (or lack thereof).

But in Japan, about 160,000 people were hastily and carelessly evacuated and 1,600 quickly died from that forced evacuation alone. The rest had their lives pretty much destroyed. The rest of Japan was harmed economically, and the population's health has been adversely affected by the ramp-up of coal use because of unnecessarily shutting down all their nuclear power plants.

The Fukushima response is one of the greatest bureaucratic, regulatory, and administrative failures in history—because science was trumped by fear.

Many of us in the nuclear field understand that the fear of nuclear is one of the oldest conspiracy theories in modern times, perpetrated by being blindly cemented in the world's administrative controls over nuclear since the 1950s. Often, such nonsense doesn't hurt a lot of people, but lately, we have begun to understand how widespread, purposeful misinformation can wreak havoc on a democratic society.

Brooks and Church, both of whom grew up in Washington County, Utah, determined radiation exposures and doses resulting from the Nevada nuclear weapons tests from published reports, papers, and historical records. Recent publications were used to define the doses following Fukushima (see their paper at doi.org/10.1080/09553002.2020.1721595 for methodology). The maximum dose rate in St. George was 3.5 mSv/h (May 19, 1953), while in Fukushima it was about 1–10 mSv/h at the main gate on March 11, 2011—and four days later, on March 15, 2011, about 25 miles downwind, it was 0.045 mSv/h.

The authors chose not to include internally deposited radioactive materials in the dose calculations since they depend on many models and assumptions. However, if the dose from internal emitters had been included, the doses in southern Utah would have been much higher than those in Fukushima due to the extensive contamination in Utah with strontium-90, cerium-144/praseodymium-144, cesium-137, and iodine-131, as well as several alpha emitters like plutonium-239 and americium-241 along



The explosions that spread material from the Fukushima meltdown were hydrogen gas explosions, not nuclear. (Photo: Wiki Fandom)

with other short-lived radionuclides, most of which were not present at Fukushima.

In their 2015 report “The Fukushima Health Management Survey: Estimation of external doses to residents in Fukushima Prefecture,” Tetsuo Ishikawa and his coauthors found that the individual doses to 423,394 Japanese residents during the first four months had the following distribution: 62.0 percent under 1 mSv, 94.0 percent under 2 mSv, and 99.4 percent under 3 mSv. These are small doses—around or below background levels—and have never been shown to have any adverse health effects on humans or animals. In both cases, the exposures were protracted, and it is well established that protracted radiation exposure decreases the risk of cancer (see, for example, the 2006 report by the National Research Council titled *Health Risks from Exposure to Low Levels of Ionizing Radiation*).

For comparison, the doses from computed tomography (CT) scans range from 20 mSv for a chest CT to a high of almost 100 mSv for a full body scan. There are over 90 million CT scans performed each year in the United States, with no increased adverse health effects. The difference is that an individual chooses to have a CT scan but has no say or choice in receiving the exposure from a nuclear reactor accident or an atomic bomb test, so the latter are perceived as more frightening.

Opinion continues



Opinion

So why did Japan overreact and cause more harm to their citizens than the Fukushima radiation could ever do, while Utah did not? Because since the 1950s, the world has adopted a set of models and regulations based on an idea called the linear no-threshold (LNT) dose hypothesis, which was not based on science. LNT implies that all radiation is harmful, even at very low doses, which is not correct. LNT generated and amplified the fear of any radiation to amazing levels in the minds of citizens and their leaders.

Utah in 1953 was not infected with the LNT ideology and took appropriate actions actually based on science.

Since the start of the atomic age, extensive studies on both the early and late effects of radiation have been conducted on almost every type of animal, including humans, and at every level of biological organization, from molecules to cells to individual organs to whole organisms, in order to see the influence of dose and dose rate on radiation-induced biological changes.

The development of modern molecular and cellular biology, combined with new technology, made it possible to measure biological responses in the low-dose and low-dose-rate regions. The application of these techniques to low doses and dose rates by the Department of Energy Low Dose Radiation Research Program is summarized by Brooks in his 2018 book *Low Dose Radiation: The History of the U.S. Department of Energy Research Program*. Similar approaches have been used in the European Union, Korea, and Japan.

All this research demonstrated the need for the hit theory to be replaced by more of a systems approach, with bystander effects and cell-cell and cell-tissue communication playing a major role in the biological response to radiation. The data taken demonstrated

that the biological responses and the mechanisms of action following exposure for low doses are very different from the responses to high doses.

Low-dose and high-dose responses activate a different set of genes and activate different proteins and metabolic pathways (Dauer and colleagues discuss this in a 2010 article published in *Radiation Protection Dosimetry* [doi.org/10.1093/rpd/ncq141]), suggesting unique mechanisms of action as a function of both dose and dose rate, mechanisms that are effective at mitigating radiation damage at low doses (< ~20 rem per year; < ~0.2 Sv per year) but less and less effective as doses climb above this.

These observations do not support the use of LNT as being scientifically accurate, so LNT should not be used for risk assessment or making judgments on actions to be taken following accidents or other events where populations exposed to low doses delivered at low dose rates may result in drastic unwarranted actions, like evacuation. And the United Nations Scientific Committee on the Effects of Atomic Radiation now agrees, according to the second volume of that body's 2020–2021 report.

Radiation is a very good cell killer, which is why we use it at high doses in cancer therapy. But fear—and the biological consequences and the regulatory actions triggered by that fear generated from LNT—of low doses of radiation remains the major biological damage induced by low-dose and low-dose-rate radiation exposures (see, e.g., “The high price of public fear of low-dose radiation” by Waltar et al. in the *Journal of Radiological Protection* [doi.org/10.1088/0952-4746/36/2/387]).

So, it is no wonder that Japan failed, and continues to fail, while Utah did just fine. ☒



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August 2022

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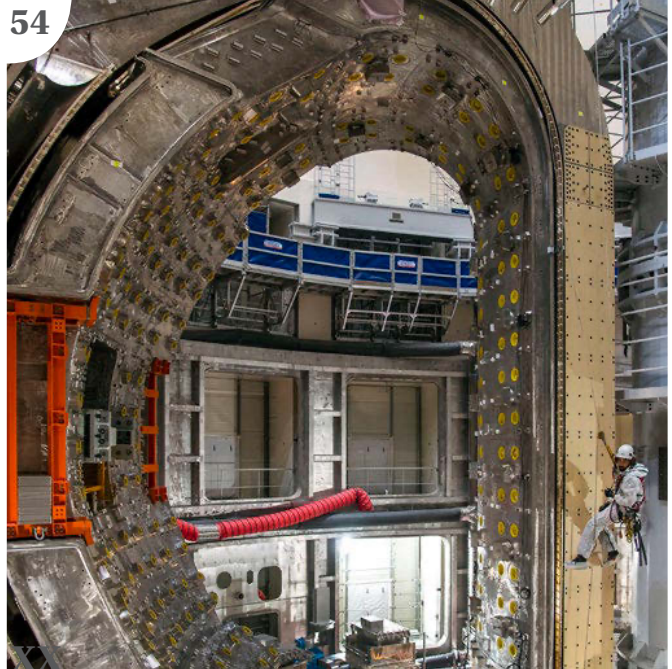
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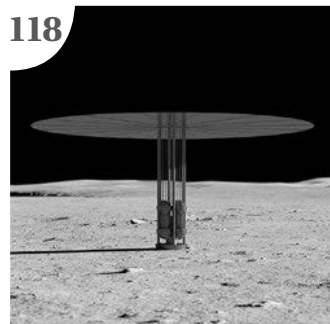
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Nuclear News (ISSN: 0029-5574), Volume 65, Number 9. Published monthly (except during the month of April when issued twice monthly) by the American Nuclear Society, Incorporated, with business, executive, and editorial offices at 555 N. Kensington Ave., La Grange Park, Illinois 60526; telephone 708/352-6611. Subscription rate for 2022 is \$725, which includes complimentary electronic access, 1959 to current issue; for subscriptions outside North America, add \$80 for shipping and handling. Alternatively, subscription rate is \$635 for Electronic Access Only, 1959 to current issue. Single copy price (regular monthly issues) is \$52; add \$12 for postage and handling if being shipped to address outside North America. Single copy price for annual mid-April Buyers Guide is \$125; add \$15 for postage and handling if being shipped to address outside North America. Individual ANS members receive *Nuclear News* as part of membership. Replacement copies may be obtained at the single copy price, as long as copies are available. Inquiries about the distribution and delivery of *Nuclear News* and requests for changes of address should be directed to the American Nuclear Society. Allow six weeks for a change to become effective. POSTMASTER: Send change of address orders to *Nuclear News*, American Nuclear Society, 555 N. Kensington Ave., La Grange Park, Illinois 60526, or nucnews@ans.org.

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