



NATIONAL ACADEMY OF SCIENCES

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Office of the President

September 11, 2013

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Dear Dr. Hengstler:

I write to express my disappointment with the inappropriate title and unsubstantiated content of Edward Calabrese's paper published on-line on 4 August: "How the US National Academy of Sciences misled the world community on cancer risk assessment: new findings challenge historical foundations of the linear dose response."

Professor Calabrese accuses 1946 Nobel Laureate Herman Muller and his colleague Curt Stern of a pattern of deception in their treatment of experiments by another scientist. Calabrese further accuses Muller of inappropriately influencing fellow members of the National Research Council's Committee on Biological Effects of Atomic Radiation (BEAR) (NRC, 1956) about the genetic effects of ionizing radiation in humans.

Calabrese uses correspondence between Muller and Stern concerning experiments on germ cell mutations in male fruit flies, along with subsequent scientific publications by both scientists, to make unsubstantiated insinuations about Muller and Stern's motivations: For example, that Muller was "...[p]rotecting his reputation by ensuring that his misleading comments would not be discovered while still aggressively pushing acceptance of the linearity agenda" (p. 2). And "In the absence on new data, Stern decided upon a new strategy to 'save' the single-hit linearity dose response" (p. 3). Calabrese also makes *ad hominem* remarks about Muller to support his accusations: For example, "... it was well known that Muller would try to win arguments by exaggeration and overstatement" (p. 3).

It seems clear from Calabrese's factual descriptions that Muller and Stern were trying to make sense of experiments that yielded unexpected results. It is not surprising that they would question these results and seek to have them replicated. Calabrese clearly disagrees with Stern and Muller's scientific judgments, but he is able to marshal only circumstantial evidence to support his accusations that they sought to suppress the experiments. In the end the experiments were published (Caspari and Stern, 1948) and served to spur-on additional scientific investigations.

Calabrese also asserts that Muller "[m]ade deceptive statements during his Noble (sic) Prize Lecture ... that were intended to promote the acceptance of the linear dose-response model for risk assessment for ionizing radiation" (p. 1). This assertion is based on statements made by Muller in his lecture in support of the linearity hypothesis even though he had received the

manuscript containing the experimental results some five weeks earlier. Given Muller and Stern's reluctance to accept the results of these experiments without replication, Muller's decision not to mention them is certainly not surprising. It is unfair to call his behavior deceptive.

Calabrese provides no evidence that Muller inappropriately influenced the BEAR committee or that the NAS or the BEAR committee misled anyone. The BEAR committee considered a large body of scientific work and exercised its own considerable scientific judgment in reaching a consensus conclusion that "the genetic harm [from radiation] is proportional to the total dose" (NRC, 1956, p. 23). Moreover, the BEAR committee noted that this conclusion was generally accepted by the genetics community (ibid).

The BEAR committee's conclusion applied specifically to genetic damage resulting from radiation-induced mutations. However, scientific understanding of radiation effects in humans has advanced substantially since the 1956 BEAR report, a fact never acknowledged by Calabrese. Our current understanding of radiation health effects is based on long-term human epidemiological studies on cancer incidence and mortality as well as a large body of radiation biology research. NAS has carried out several reassessments of radiation health effects since the 1956 BEAR report. The latest assessment, Biological Effects of Ionizing Radiation VII, was published in 2006 (NRC, 2006). That report concluded that the linear no-threshold model provides "the most reasonable description of the relation between low-dose exposure to ionizing radiation and the incidence of solid cancers that are induced by ionizing radiation" (NRC, 2006, p. 6). The report also notes that uncertainties in the linear no-threshold relationship are high at low doses. Future research will likely help to further clarify the relationship between ionizing radiation and disease causation in humans.

It distresses me to see this article's accusations, with no actual supporting evidence, in a serious scientific journal. Drs. Muller and Stern are deceased and cannot defend themselves against these accusations. Both scientists were elected to our academy by their peers (Muller in 1931 and Stern in 1948) in recognition of their considerable scientific achievements, and Muller was honored with the 1946 Nobel Prize in Physiology and Medicine for his lifesaving work on the physiological and genetic effects of x-rays. In the 1950s, he joined his fellow scientists in warning the American people about the dangers of atomic war and fallout. With Linus Pauling, he worked to bring about a worldwide nuclear test ban treaty.

I hope that you will publish this letter so your readers can benefit from a more reasoned treatment of what Drs. Muller, Stern and the NAS have contributed to the field of radiation health effects.



Ralph J. Cicerone
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References

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