Arch Toxicol
DOI 10.1007/s00204-015-1455-3

LETTER TO THE EDITOR, NEWS AND VIEWS

Cancer risk assessment foundation unraveling: New historical evidence reveals that the US National Academy of Sciences (US NAS), Biological Effects of Atomic Radiation (BEAR) Committee Genetics Panel falsified the research record to promote acceptance of the LNT

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Received: 15 December 2014 / Accepted: 6 January 2015

Abstract The NAS Genetics Panel (1956) recommended a switch from a threshold to a linear dose response for radiation risk assessment. To support this recommendation, geneticists on the panel provided individual estimates of the number of children in subsequent generations (one to ten) that would be adversely affected due to transgenerational reproductive cell mutations. It was hoped that there would be close agreement among the individual risk estimates. However, extremely large ranges of variability and uncertainty characterized the wildly divergent expert estimates. The panel members believed that sharing these estimates with the scientific community and general public would strongly undercut their linearity recommendation, as it would have only highlighted their own substantial uncertainties. Essentially, their technical report in the journal Science omitted and misrepresented key adverse reproductive findings in an effort to ensure support for their linearity recommendation. These omissions and misrepresentations not only belie the notion of an impartial and independent appraisal by the NAS Panel, but also amount to falsification and fabrication of the research record at the highest possible level, leading ultimately to the adoption of LNT by governments worldwide. Based on previously unexamined correspondence among panel members and Genetics Panel meeting transcripts, this paper provides the first documentation of these historical developments.

Keywords Mutation · Cancer · Risk assessment · Linear no-threshold (LNT) · Threshold dose response

In 1956, the US National Academy of Sciences (NAS) published their long-awaited reports addressing national concerns about how ionizing radiation may affect such entities as oceans/fisheries, agriculture/food supply, meteorology/atmosphere, medicine/pathology, genetics and disposal of radioactive wastes. As it turns out, the report that dominated the attention of the scientific community and media was that of the Genetics Panel. It proclaimed there was no safe level of exposure to ionizing radiation and offered dire warnings about severe adverse biological effects occurring in present and future generations. Societies, world governments and medical communities needed to heed the mutational risks that could persist across generations as a result of exposures to even low doses of ionizing radiation. The panel emphasized that the then extant threshold dose–response model was wrong and misled society on the hazards of low doses of ionizing radiation. To better protect the public health and to provide more accurate predictions, the report urged the risk assessment community to adopt a linear dose–response model. This recommendation represented no less than a paradigm shift that would alter the courses of both international environmental policy and cancer risk assessment to the present time. The LNT dose response was soon generalized from assessing the radiation risk of mutation to the radiation risk of cancer and then generalized once again by the US EPA to assessing the chemical risk of cancer. In retrospect, the road to linearity can be directly traced back to the BEAR Committee, Genetics Panel (Calabrese 2009, 2013).

Despite their tidal wave of success in 1956 and in the years following, the radiation genetics community had

Electronic supplementary material The online version of this article (doi:10.1007/s00204-015-1455-3) contains supplementary material, which is available to authorized users.

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Published online: 20 January 2015

already been seeking a switch from the threshold to the linear dose–response model for nearly 30 years (Calabrese 2013), i.e., starting from a time soon after Muller's famous Nobel Prize winning discovery in 1927 that X-rays can induce mutations in the sperm of male fruit flies. Muller, Curt Stern and other prominent researchers from the radiation genetics community had long challenged the risk assessment methods for ionizing radiation and proposed using the far more conservative linear dose–response model. However, at each turn in the road, another similarly recalcitrant medical committee opposed their challenges and supported the more lenient threshold dose–response model instead. This frustrated Muller and his kindred radiation geneticist colleagues. In all major advisory committees to that point, the cards were "stacked" against them. However, with the creation of the NAS Committee, which was funded by the Rockefeller Foundation, the political tide turned their way. The decision to create an NAS Genetics Panel meant that Muller and his group would no longer be token geneticists on a committee oriented toward and dominated by the medical community; they would now be the dominant force on a BEAR I Committee whose 17 members included 13 notable geneticists. This may have seemed like a dream come true as the panel would now have no opposition to the big issue of the day: that is, finally getting linearity to drive the mutation risk assessment. The panel would soon proclaim that LNT was the new risk assessment "law" of the land, with little, if any, need for discussion, debate or evidence-based examination via scientific assessments. Thus, the panel moved to other challenges. Instead of debating the merits of the threshold vs LNT, the Chair of the Panel requested that all the geneticists on the panel provide their best estimates with upper and lower confidence intervals for the number of adversely affected children born to parents' whose gonads were exposed to a certain dose of radiation.

Despite the fact that there was a wide range of geneticists (e.g., human, fruit fly, bacterial, etc.) comprising the panel, it was hoped that there would be a high degree of agreement/consensus on what the specific population risks might be. If the panel members could independently come to a convergent agreement on risks, it would strongly support their risk assessment judgment and the linearity dose–response paradigm that they wanted society to adopt.

It is here where the story gets interesting. Through a variety of unexpected discoveries, it was possible to determine that the panel of geneticist experts wildly differed among themselves on the estimates of population risks, and, in fact, felt very uncertain about their own estimates of mutation frequency in future generations. The emergence of such uncertainties rattled the leaders of the panel and eventually led the Genetics Panel to omit key data from the research record, all in an effort to disguise the vast uncertainty that existed for the projected human risks. These factors and issues were known by the panel and are evident in the numerous letters that were exchanged between them and the Panel Chair; the panel even voted to hide the uncertainty from the scientific community by omitting key data and misrepresenting the predicted risks. In effect, the NAS BEAR Committee, Genetics Panel committed scientific misconduct in their publication in the journal Science in June, 1956 (Anonymous 1956). By omitting and misrepresenting the actual data, the panel hoped to convince the scientific community and the public to adopt their linear dose–response model in the assessment of risks associated with exposures to ionizing radiation, especially at low doses. These falsifications and fabrications are detailed and presented for the first time in the supplemental data section; they expose the fraudulent actions of the Genetics Panel and call attention to the vast impact they have had on cancer risk assessment.

Acknowledgments Research activities in the area of dose response have been funded by the United States Air Force (FA9550-13-1-0047) and ExxonMobil Foundation over a number of years. However, such funding support has not been used for the present manuscript.

Conflict of interest Author declares no conflict of interest.

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