

## **Rulemaking1CEm Resource**

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**Docket:** NRC-2015-0057

Linear No-Threshold Model and Standards for Protection Against Radiation

**Comment On:** NRC-2015-0057-0010

Linear No-Threshold Model and Standards for Protection Against Radiation; Notice of Docketing and Request for Comment

**Document:** NRC-2015-0057-DRAFT-0276

Comment on FR Doc # 2015-15441

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## Submitter Information

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## General Comment

The petitioners may be right. I would like the NRC to investigate their case in detail, and specifically request the scientists they critique to respond fully, before arbitration by the NRC.

Hormesis and threshold hypotheses were examined by the National Academy of Sciences BEIR VII report and by the International Commission on Radiological Protection, and were rejected in favour of LNT, based on the full balance of scientific evidence from the laboratory, from animal studies and from human epidemiology. I understand that UNSCEAR has a broadly similar position. The petitioners claim that all these investigations, and all the scientific studies supporting LNT, not to mention those supporting supralinearity, are flawed or faked or biased, whereas they apparently consider all or most of the work supporting hormesis to be scientifically sound. This, if theoretically possible, seems a little unlikely. Unconscious bias is always possible in areas where the data is ambiguous or sparse, but it is somewhat unscientific to believe that such bias can only affect ones opponents.

To partly resolve the issue, it should be a relatively simple matter for the NRC to specifically put the petitioners case to the relevant scientists from BEIR, the ICRP and UNSCEAR, and to those supporting supralinearity, asking those scientists for detailed comments, allow the petitioners further comment, and so on, and for the NRC to then arbitrate as best it can. It is a considerable opportunity to advance this discussion a little in a reasonably polite, scientific and public framework.

In particular, one central claim - that hormesis is effectively now proved by apparent sublinearity in the latest

Hiroshima/Nagasaki data in the 300 to 700 mSv dose range - needs to be investigated. The assumption is that hormesis is therefore universal across lower ranges. The evidence seems to indicate that assumption is not warranted, especially with recent studies of high statistical power claiming strong evidence for effects well below even the often-cited 100 mSv threshold for proven effects.

Epidemiology - studying real world, long-term health effects on real people - is high up the evidence pyramid, above lab work and animal studies. Much of the support for LNT comes from epidemiology, whereas much evidence for hormesis comes from the lab, with little or no strong evidence from epidemiology. The main reason we are still having this debate is the difficulty epidemiology has had in detecting effects above statistical background noise at low or very low doses. Adopting a hormesis hypothesis does not make that difficulty magically disappear.

Older epidemiological studies from high background areas of radiation, in spite of being widely quoted in this debate as proving a threshold or hormesis, are regarded as fundamentally flawed and are not accepted by BEIR or the ICRP. Newer, more careful, studies, however, do indicate increased risk, as do similar studies of nuclear workers and CT scans. Yet the petitioners dismiss LNT entirely and accept hormesis as scientific truth. This lack of doubt seems unwarranted. Error is always possible. Bias is always possible. Certainty, especially in this extremely controversial field, seems unscientific. It is possible that low or very low doses are indeed hormetic. It is also possible that the risks are supralinear. It is, according to the general scientific consensus, more probable that the risks, although low or very low for individuals, and despite numerous uncertainties, are in line with LNT, and that this should be the guiding assumption for public protection purposes. And as an interested layman, this is how I want scientists and especially public bodies tasked with protecting the public, individually and collectively, to defend my health and interests, and those of society.

In my opinion, the petitioners appear to have exaggerated the case for hormesis, over-criticised LNT, and completely ignored the case for supralinearity. A little modesty, and therefore caution, about our knowledge of radiation and the human body is warranted. In radiation protection, this means, at a minimum, the continued use of LNT. In particular, since the National Academy of Sciences is undertaking a study into possible cancer clusters around US nuclear power stations, any change in regulation prior to that report is premature.