Should the Bell Toll for LNT?

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Body of Abstract: The time is fast approaching when the ICRP will make new recommendations on radiation protection, which are likely to stand for the next 15 years or more. The cornerstone of previous recommendations has been the assumption that the risk of radiation-induced cancer is proportional to the dose – the “linear no-threshold” (LNT) model – with risk coefficients based on the observed effects of acute doses greater than 200 millisievert. The LNT model has been a convenient tool in the practice of radiation protection but there are no data to support it at doses less than about 100 millisievert or at chronic dose rates up to at least 50 millisievert per year. Hence, radiation protection practices based on the LNT model yield no demonstrable benefits to health when applied at dose rates below a few tens of millisievert per year.

At lower levels of dose and dose rate, bio-positive effects (sometimes called “radiation hormesis”) have been reported. According to a recent article published in Nature [1], hormesis should be expected at low levels of radiation exposure. This being so, the assumption that such exposures are harmful would not be conservative.

The LNT assumption has been followed in setting the long-term occupational dose limit at 20 millisievert per year. It has also been used as the basis for controlling public exposures to ALARA levels which are substantially less than 1 millisievert per year, sometimes at enormous cost, and for predicting numbers of hypothetical deaths from low levels of radiation exposure. These practices have helped to foster an unwarranted fear of low-level radiation.

For its new recommendations, to be issued probably in 2005, the ICRP has said that it expects to continue the application of the LNT model “above a few millisievert per year” [2]. National regulatory authorities would need to consider whether to follow such recommendations. In the meantime, national societies for radiation protection may wish to consider the need to lobby the ICRP, through the auspices of IRPA, to further relax adherence to the LNT assumption.

References