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The Chernobyl deniers use far too simple a measure of radiation risk

Those who downplay the dangers of nuclear energy are wrong to focus only on dose

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In his article on "the confusing world of radiation exposure", readers' editor Chris Elliott was right to point out that getting a whole year's sunshine in an hour would fry him to a crisp ([Open door](#), 4 April). Radiation dose rate is important. What he didn't say is that "dose density" is important too.

The "sievert", as Elliott says, is a dose unit for quantifying radiation risk. He did not add that it assumes dose density is uniform. "There are many kinds of radiation", he says, but he does not mention how they differ. In fact, external sources like cosmic rays and x-rays distribute their energy evenly, like the sun; others, notably alpha-emitters like uranium, are extremely uneven in the way they irradiate body tissue once they have been inhaled or swallowed.

Because alpha particles emitted from uranium atoms are relatively massive, they slow down rapidly, concentrating all their energy into a minuscule volume of tissue. Applying the sievert to this pinpoint of internal radiation means conceptualising it as a dose to the whole body. It's an averaging error, like believing it makes no difference whether you sit by the fire to warm yourself or eat a burning coal. The scale of the error can be huge.

Radiation protection officials fell into this averaging trap in 1941. The Manhattan Project, rushing to build the atom bomb, was creating many new radio-elements whose health effects were unknown. Summing them all – external and internal, alpha, beta, gamma or whatever – into a single dose quantity gave an impression of certainty and precision. Post war, the US National Council on Radiation Protection closed down its internal exposure committee because it took the complexities too seriously. From then

on radiation effects were estimated from acute external radiation at Hiroshima and Nagasaki – studies which are entirely silent on internal radioactivity. In 1952 the US forced this mindset on to the newly formed International Commission on Radiological Protection (ICRP) whose advice now has almost the force of international law. In 2004 the UK scientific committee CERRIE challenged the commission's view by reporting that dose could be meaningless at the scale of molecules and cells.

If one mentions published studies which show, for example, increased cancer in Sweden after Chernobyl or the doubled risk of child leukaemia near German nuclear power stations, health officials say the ICRP model doesn't predict them: "Doses were too small to be the cause."

Chernobyl is an acid test of ICRP's risk model since, at around 2 or 3 milliSieverts, doses were close to natural background. If this level of fallout was proved to cause any health detriment, the ICRP model would fall and the economics of nuclear power would worsen dramatically. So Chernobyl denial is crucial to nuclear interests. George Monbiot's article quoted a UN committee on Chernobyl: "There has been no persuasive evidence of any health effect [other than thyroid cancer] in the general population that can be attributed to radiation exposure" (The unpalatable truth is that the anti-nuclear lobby has misled us all, 5 April). But this too is based on the flawed ICRP model; there is a lot of evidence and many scientists attribute it to the accident.

Monbiot's recent blog (The double standards of green anti-nuclear opponents, 31 March) relies on his friends Mark Lynas and Chris Goodall who in turn cite *Radiation and Reason*, a book by Professor Wade Allison. But Allison's preface says, "many important topics have been omitted ... in particular the subject of micro-dosimetry is treated rather briefly in spite of its importance for future understanding". Monbiot and colleagues should note that in fact Allison doesn't discuss micro-dosimetry at all. It's easy to spin something if you leave out the difficult, challenging science.

ICRP has admitted that its model cannot be applied to post-accident situations. Fortunately the European Committee on Radiation Risk employs weighting factors to modify sievert-based doses for internal exposures. This won't cure the mess in Fukushima but it will mean better public protection.

