

Radiation's benefits

Lawrence Solomon, **Financial Post** · Saturday, Sept. 25, 2010

"There is no safe level of radiation." For the last 30 years, my colleagues and I at the Energy Probe Research Foundation have held that view, and espoused it through books, media appearances and presentations to regulatory bodies, helping in no small measure to tighten Canada's radiation standards. The science on radiation as published by official bodies, we knew, made clear that any dose of radiation, no matter how small, carries with it an additional risk of contracting cancer. The upshot was a better-safe-than-sorry stance: Don't frivolously accept X-rays; take special care in disposing of smoke detectors, worry about routine releases of radiation from nuclear facilities.

This stance is now reeling. Low levels of radiation, science is increasingly telling us, are not only safe, they are actually healthful. It may be more prudent to worry about getting too little radiation than too much.

The latest book to question the conventional wisdom on radiation comes from Springer-Verlag, a venerable academic science publisher whose stable of writers over the years has included some 150 Nobel laureates. Springer's book is not for the pop-cure reader, as attested to by its \$240 price tag and its intimidating title, *Radiation Hormesis and the Linear-No-Threshold Assumption*.

The title, however technical, tells the tale of a controversy of immense implications. Hormesis describes something that does harm in large doses but good in small doses. We are all familiar with such hormetic relationships, even if we don't use the term -- we need various vitamins and minerals for our survival, including ones with scary names such as arsenic, but if we overdose on some, we can suffer disability or death. The trick is to get enough to avoid a deficiency in a substance we need, but not so much that it will poison us. An even better trick is to identify the ideal dose -- to be able to max out on our intake of vitamins, say, while avoiding any harm. This trick -- understanding when we are getting too much of a good thing -- is the essence of the rapidly growing scientific inquiry into hormesis.

The other head-scratching term in the book's title--linear-no-threshold assumption, or LNT for short -- refers to the assumption that radiation is an exception to the hormesis rule, and that radiation can never be a good thing. Unlike other substances, which have a threshold between a good dose and bad, the conventional wisdom has assumed that radiation has no threshold -- every dose is bad, and the bigger the dose, the badder it gets, in a straight line relationship.

This is the linear-no-threshold assumption, with "assumption" an all-important word that needs to be taken literally. While no one disputes that high doses of radiation cause harm, no one has proof that low levels cause harm. Surprisingly, the scientists and government bodies that adhere to the LNT assumption will tell you that no proof of harm at low levels is even possible because the risk is too low to measure statistically. In the absence of proof, they say, the only prudent course is to play it safe by assuming that low levels of radiation cause harm.

But is it safe to assume that humans, who evolved in a radiation-rich environment, and who live in a world that continually bombards us with natural, background radiation, would be better off by curtailing our exposure to radiation? "Literally millions of lives are less healthy because they have been convinced that living in radiation-deficient environments is healthy; lives are lost in not implementing effective low-dose radiation therapy to treat cancer; lives are lost out of fear of diagnostic radiation that saves lives," writes Charles Sanders, the book's author and a participant in radiobiological research over half a century.

Mr. Sanders makes his case for the robustness of hormesis research by citing hundreds of studies -- this heavily footnoted scientific text does not make for easy reading. For those readers not interested in ploughing through descriptions of studies that often infer the effects of radiation--it would be unethical to deliberately expose a large healthy population to radiation for the sake of an experiment --the book's real-life scientific studies will more than suffice.

Take the case of "an almost perfect study in a human population that demonstrates the highly significant protective effects of near-continuous exposure to gamma radiation." This case involved more than 180 apartment buildings that had been constructed in Taiwan in the early 1980s using recycled steel that was subsequently discovered to have been contaminated with radioactive cobalt-60. The 10,000 people who were housed there received large doses of radiation over a period of nine to 20 years that, according to LNT theory, should have led to a total of 302 cancer deaths over the 1983-2003 period studied, 232 of which would have been ordinarily expected had no radiation exposure occurred, with the additional 70 stemming from the exposure. To the researchers' surprise, however, only seven cancer deaths were found, 225 fewer than would have occurred had the buildings been free of radiation. Instead of radiation increasing the death toll by 30%, it may have reduced the death toll by a staggering 97%.

The number of birth defects among children born in this radioactive environment also confounded LNT theory. Instead of the 48 defects expected, just three occurred.

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Mr. Sanders' book deals primarily with health issues: leukemia as well as cancer of the breast, lung, liver, and central nervous system; birth defects; the immune system; inflammatory diseases; and longevity (one of several studies that he cites shows an increased average lifespan of 10.4 years among Americans). But he also touches on other matters of immense importance, such as the cost to society of dealing with perverse regulations -- a cost that could amount to trillions of dollars -- and the politicization of science. The LNT camp has been trying to discredit hormesis by stifling debate, rather than by conducting peer-reviewed counter studies.

Mr. Sanders' book is not the first to deal with radiation hormesis and it won't be the last -- research in this field has been increasing at an exponential rate and can only grow unless it can be disproven. The safest course for society is to get on with the research.

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