

Facing the Facts About Nuclear Radiation — Is it really so harmful?

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[SUMMARY] (by Editorial staffs) National radiation regulations are very restrictive in most countries, to response the fear of people. International Commission on Radiological Protection (ICRP) recommended that national radiation regulations should require that any exposure be kept As Low As Reasonably Achievable (ALARA). There are no reasonable reasons to adopt such regulations. People in Fukushima confront the highly mental pressure. It is evident that ALARA-based regulations should be reconsidered.

In particular places and at certain times renewable sources can make important contributions to the supply of energy but they become very expensive and unreliable as a complete answer. Nuclear power is the only viable large scale substitute for fossil fuels but this is unwelcome to many people because of their concern about radiation.

In the eight months since the Fukushima accident there has been intense press coverage of the nuclear scene, but no deaths from radiation. This is rather curious. Usually major accidents that command such extended media attention involve death tolls of tens, hundreds, even thousands. At Fukushima three reactors have destroyed themselves and, to that extent, the accident is worse than the single-reactor accidents at Windscale (1957), Three Mile Island (1979) and Chernobyl (1986). But there were no deaths there either, except at Chernobyl where the known toll has now been established at less than 50 [1]. So have we made a mistake? Is nuclear radiation more benign than generally supposed?

The view of nuclear radiation as extraordinarily dangerous is based more on history than science. During the Cold War fear of radiation was an important and effective international weapon that inevitably raised intense reaction on the home front too. At that time, where they were free to do so, many marched, demonstrated and voted for a life free of nuclear weapons and of nuclear radiation too. Responding to this pressure the International Commission on Radiological Protection (ICRP) recommended, as it still does today [2], that national radiation regulations should require that any exposure be kept As Low As Reasonably Achievable (ALARA). Natural background from rocks, space and the radioactivity within the human body provides the base, to which relatively small additions can be described as “certainly safe”, thereby providing the reassurance that public opinion demanded; but that does not mean that much higher levels might not also be safe. These ALARA levels quickly became enshrined in legislation and working practices, although they remain many factors of ten below an actual danger to anyone's health. Furthermore, although designed to appease fears of radiation, they failed to do so and the public, uninformed and encouraged by the press, continues to worry, generating political pressure for radiation protection regulations more restrictive still.

When a new technology is introduced, risks are poorly understood, monitoring and control are weak and it is reasonable to take a precautionary view of safety. So it was, for instance, when “locomotives” first appeared on the roads, driven initially by steam but later by internal combustion. Under the influence of popular pressure safety laws restricting speeds to 2 or 4 miles per hour were enacted in the Red Flag Act of 1865 (UK). Fortunately for modern civilisation, in 1896, coincidentally the same year in which radioactivity was discovered, these traffic restrictions were relaxed by factors of 20 or more. Initially the public

thought such traffic unacceptable (and liable to frighten the horses), but progressively the technology improved and accident rates fell. Mankind learnt to accept the risks and reap the benefits, even though traffic still gives rise to extreme danger, just a few metres away in the path of an oncoming vehicle -- but people avoid these. The caution that prevailed in the 19th century seems unthinkable today, and nobody would suggest special measures for children, such as preventing them travelling by road, for example.

There is no reason to handle the safety of radiation and nuclear technology any differently. It should be a matter of balancing risks against benefits in the light of experience, but unfortunately that is not what has happened. In 1951 the safety level was set at 3 millisievert per week (12 millisievert per month) [3]. Although the civil nuclear radiation safety record has been exceptionally good, since 1951 the maximum level recommended for the general public has been reduced by a factor 150 in the name of ALARA. Was this sensible? In fact experience with radiation doses used for the benefit of personal health in clinical medicine suggests that the safety level might have been increased by a factor of 8.[4]. Quite coincidentally, such a factor would be not dissimilar to the relaxation of traffic speeds. Interestingly, of the Nobel laureate husband and wife team who elucidated the science of radioactivity, Pierre Curie died in a horse-drawn traffic accident in Paris in 1906, whereas Marie Curie, despite receiving an untold radiation dose throughout her working life, lived on to 1934 -- but it is not scientific to draw conclusions from individual cases, even of the most famous scientists!

Radiation used for diagnostic medical imaging incurs a dose of 5-10 millisievert to the patient, whether provided by an internal or an external radiation source. To receive the same dose from eating meat contaminated by radioactive Caesium at the level recently flagged by the Japanese Government [5], a patient would have to eat a tonne in a period of about four months! This regulation is unreasonable. Like the level used to guide the evacuation policy at Fukushima, it derives from ALARA. That policy is based on the equivalent of two whole-body CT scans per year. This is harmless, as may be judged from the fact that a radiotherapy patient who, while receiving a dose fatal to the target tumour, also receives a dose equivalent to a thousand or more CT scans to tissue and organs within 10-20 cms [4, 6]. Such tissue and organs usually survive and, indeed, most people have a friend or relative who has been thankful for such treatment.

At Chernobyl such food and evacuation policies contributed to severe stress, social and psychological, with health consequences more widespread than any effect of the radiation itself [1,4]. This unfortunate mistake has been repeated at Fukushima. Although hard statistics are not yet available, it was described to me personally by civic leaders, doctors and teachers during a recent visit to the Fukushima region how fear of radiation and current policies are causing despair, collapsed businesses, suicides, community disintegration and disorientation among the elderly.

The current tight radiation "safety" levels, scientifically unsupportable and adopted in response to vague public angst, could be relaxed by a factor of about a thousand without significant health consequences [4]. The worldwide economic benefits of a general retreat from ALARA would be very substantial; while expenditure on tight control of nuclear reactor stability should continue, most other safety costs of the nuclear power option would be drastically reduced. It is difficult to see why energy consumers around the world would willingly shoulder the unjustified extra costs of ALARA (including those of handling waste). Seen in this light, it is evident that ALARA-based regulations should be reconsidered, that is, the nuclear "Red Flag Act" should be repealed.

References as footnotes or links according to editorial style:

[1] IAEA Report (2006) and UN Report (2011)

[2] ICRP Report 103 (2007)

[3] reference [2] p. 35

[4] Radiation and Reason (2009)

[6] Japanese Govt. Regulation, 27 July 2011

[5] Royal College of Radiologists (2006)

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