

Understanding radiation risks: Lessons from Paris

Comprehending radiation risk is a real and major problem confronting society today. Perhaps every professional working in this field has had experiences similar to one I will share with you. Frequently during my air travels, I enter into a conversation with my neighbour — generally, a well educated professional. In a few minutes he discovers that I am involved in nuclear safety and inevitably the conversation turns to questions about radiation and its health effects.

“What can you tell me about Hiroshima or about the vast environmental contamination caused by Chernobyl?” I usually begin my answers by explaining that as we speak we are being constantly bombarded by a broad range of radiation, not only from the cosmos, but also from the food we are consuming. That seemingly new and troublesome point is followed by my comments explaining that the many victims of Hiroshima were not killed directly by radiation, but by the explosion and the heat wave created from the nuclear detonation. Of the 80,000 survivors who received very high doses of radiation, less than 500 have incurred illnesses so far which are attributable to the radiation exposure — a statement that is also new and received with disbelief. But the figures are scientifically factual. About 8000 survivors have indeed died from solid cancer tumors, but epidemiological studies indicate that less than 500 can be attributed to radiation effects. The remainder are normal tumors of the type that will threaten all of us, whether survivors of Hiroshima or not. It seems that most of us, even the professionals, do not realize or want to acknowledge that cancer is a very common occurrence. Twenty five percent of us will incur a fatal cancer.

The answer to my neighbour's second question concerning Chernobyl elicits the same disbelief. Certainly the fact that the entire environmental contamination of Chernobyl has produced a global radiological impact equivalent to an additional world exposure to 20 days of natural background radiation is more difficult to comprehend, let alone understand. The same is true of the health effects to the surrounding population which, except for the apparent, expected, and regrettable increase in thyroid cancer in children, will be sufficiently small so as not to be discernible through epidemiological studies.

Why does my neighbour not believe me? Certainly, his perception of the facts is different from mine. Why? Many of us have been very pessimistic about our ability to deal with the public's comprehension of radiation risk. Ra-

diation is mysterious; it is invisible, intangible, odourless, silent, and associated with warfare.

To explore this issue in more depth, the IAEA in October 1994 organized upon the invitation of France an International Conference on Radiation and Society: Comprehending Radiation Risk. It was the first major international meeting devoted to the subject, and attracted more than 400 participants from 50 countries and nine international organizations.

The conference sought to bring about a better comprehension of the risk attributed to the exposure to ionizing radiation. This is an important and serious subject for all of those concerned with the uses of atomic energy and ionizing radiation for health applications, improving the food supply, generating electricity, and producing consumer and industrial products. The large audience — a unique mixture of technical specialists, social scientists, decision makers, and media professionals — was an indication of the high level of interest in radiation and how individuals and society perceive its effects. The conference's goal was not a further elaboration of technical information, but a better comprehension of radiation risk. And by comprehension the Conference had certainly desired to promote not only an understanding of the scientific facts of radiation health effects, but also and more importantly an ability to express these facts in a form useful to the public and the decision makers.

The goal was ambitious, perhaps too ambitious. The conference had only limited success in satisfactorily dealing with the question of the comprehension of radiation risk. Yet the concerned specialists may have gained some better insights as to where the roadblocks to better comprehension lie. There are many.

Scientists too often speak to themselves and this pattern was very evident during many of the conference sessions. There could have been more efforts to present facts and conclusions in an understandable and communicative language. Some specific examples may be illuminating:

- It would have been useful to further discuss the implications of some remarkable facts among the 80,000 survivors of Hiroshima. Fewer than 500 have so far incurred a fatal cancer attributable to radiation exposure — and the average loss of life expectancy among the survivors is about 1 year while those that have incurred the fatal cancer had their life cut short by 10 years.
- It would also have been desirable to discuss the reported thyroid nodules cases in the

Marshall Islands and in Nevada by not only confirming that large exposures to radioactive iodine produces cancer nodules, but by also referring to the rather relatively small number of cases involved.

- As for the Chernobyl studies, speaking about a 2500% increase in thyroid cancers in children ignores the importance of the accuracy of the pre-Chernobyl reference value for these studies, which surely involves major uncertainties. It would have added more to the comprehension of health effects to have expressed the results as five cancers per 100,000 children and to refer more precisely to the total number of cancers to be expected in the various regions. An unemotional discussion of the clinical outlook for these children would also have been useful.
- There were a number of references to cardiovascular effects of radiation. This effect must be clearly qualified by indicating the many compounding factors and the more likely cause, which is other factors such as stress.
- In the discussion of cancer clusters, such as leukaemia clusters, it is necessary to repeatedly emphasize that clusters always exist in nature. They have been found long before nuclear power existed and are also found in locations remote from nuclear installations — and that in any case the number of excess cancers are few. Discussion of the Seascale cluster (reported in the 1980s in the United Kingdom) lingers on although most involved scientists believe it is not in any way connected with radiation. Why are the profound limitations of linking clusters to any cause not clearly and repeatedly stated? Furthermore, in much of the scientific community, epidemiology is recognized as an observational science with severe limitations. Epidemiological studies often involve small numbers of excess cancers with substantive compounding factors, such that for most situations positive as well as negative results must be taken with caution. The profound limitations of epidemiological studies should also be clearly and repeatedly stated.
- There was a need for further discussion in Paris of why there are so many differing national policies concerning radon control and the reasons for this.
- Finally, there was a very conspicuous limited use of comparison in most presentations. Comparisons could enable the radiation risk to be put into some perspective with other risks and at the same time also intro-



Dr. Rosen

duce the notion that life involves many risks along with benefits.

- On the positive side, the conference format chosen for this meeting was helpful in conveying information and promoting audience participation. The use of a rapporteur and chairman to present information and lead discussions has proven successful in many recent IAEA meetings. Using this format, the conference systematically covered the technical aspects, followed this by some particularly relevant case studies, and then brought in the media and decision makers. The carefully chosen format thus facilitated meaningful discussion. As a whole, the sessions and the conference have been a significant step ahead in a process which undoubtedly will require additional time and attention.

The IAEA can help this process. One of its functions is to advise on how to develop standards and practices which adequately speak to the needs of constituents — the scientists, the social scientists, the decision makers, and the public. The deliberations at the conference will surely provide the Agency with insights into how to make this function more effective.

The IAEA, together with the European Commission and the World Health Organization, has also organized a major international meeting in April 1996 to further look at the health and environmental consequences of the Chernobyl accident — 10 years after the disaster. It is hoped that, after the meeting, there will be a better comprehension of the radiological consequences of Chernobyl. — *Morris Rosen, Assistant Director General and Director of the IAEA Division of Nuclear Safety.* □