The Controversy Over Radiation Safety

A Historical Overview

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The hazards of ionizing radiation have aroused concern since a short time after the discovery of x-rays and natural radioactivity in the 1890s. Misuse of x-rays and radium prompted efforts to encourage radiation safety and to set limits on exposure, culminating in the first recommended "tolerance doses" in 1934. After World War II, the problems of radiation protection became more complex because of the growing number of people subjected to radiation injury and the creation of radioactive elements that had never existed before the achievement of atomic fission. Judging the hazards of radiation became a matter of spirited controversy. Major public debates over the dangers of radioactive fallout from atmospheric bomb testing in the 1950s and early 1960s and the risks of nuclear power generation in later periods focused attention on the uncertainties about the consequences of exposure to low-level radiation and the difficulties of resolving them.

(*JAMA* 1989;262:664-668)

NEARLY a century after the discovery of x-rays and natural radioactivity, the health hazards of ionizing radiation continue to provoke controversy. During the past few months, for example, scientists have offered sharply conflicting opinions about the dangers of radioactivity from nuclear accidents at Three Mile Island and Chernobyl and from radon levels in millions of American homes. In addition, public fears about the risks of radiation exposure have been fueled by recent revelations about radiation released into the environment from nuclear weapons plants.

The debates center on evaluations of the hazards of low-level exposure and judgments about whether the risks of using radiation sources outweigh their benefits. How, for example, should the environmental costs of nuclear weapons production be balanced against their role in national defense? Are the advantages of nuclear power plants a fair price for the radiation they release? Are the dangers of radon severe enough to justify enormous expenditures in safeguards? There are no incontestable answers to those questions, partly because the scientific evidence about radiation effects remains inconclusive but mostly because they are not strictly scientific matters. They involve a bewildering array of national defense, energy, environmental, and public health policies and priorities that inevitably arouse differing views

Radiation hazards have been a matter of dispute for such a long time that it is easy to lose sight of the origins of the disagreements. An examination of the historical record can help to clarify the reasons why radiation safety remains such a contentious subject. This article focuses on the period from the 1890s to the early 1970s, tracing the evolution of radiation from a source of intoxicating hopes and flagrant misuse to a source of widespread public, medical, and regulatory concern.

EARLY RESPONSES TO RADIATION HAZARDS

When Wilhelm Konrad Roentgen discovered x-rays in 1895 and Pierre and Marie Curie isolated the element radium 3 years later, they inspired a wave of public excitement. Physicians quickly recognized the diagnostic and therapeutic value of x-rays, but the hazards were less apparent. THE JOURNAL reported in 1896 that "the surgeons of Vienna and Berlin believe that the Roentgen photograph is destined to render inestimable services to surgery," and it added casually: "Half an hour is the shortest exposure possible, and most [cases] require an hour."[1] E. P. Davis, editor of the *American Journal of Medical Sciences*, told the College of Physicians the same year that x-rays "might prove useful in the diagnosis of pregnancy."[2] Some physicians applied x-rays for frivolous purposes, such as removing patients' unwanted body hair.[3]

The same problem occurred in the use of radium. Although it provided an important medical advance in the treatment of cancer, it was abused even more indiscriminately than x-rays. Physicians prescribed radium solutions or injected radium intravenously to combat disorders that ranged in severity from acne to heart disease, and hucksters sold radium water or salts as all-purpose health tonics.[3,4]

It soon became apparent to scientists and physicians, however, that x-rays and radioactivity could cause serious illness. Researchers who worked with x-

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