Radiation as a Public Health Problem

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I SPEAK as a public health administrator who professes no technical competence in the field of radiation. However, for some time I have been engaged in evaluating the impact of the atomic energy program on the practice of public health in the United States.

To be classified as a public health problem, a hazard must bear an important relationship to human health or disease. It must, furthermore, affect a significant part of the population, and it must be amenable to remedial action which is within the power of society to undertake.

Unquestionably ionizing radiation meets the first two of these criteria: It has a relationship to human health and affects a significant part of the population. However, the problem of social action is a challenge that concerns all.

Past experience in public health has taught us that a problem usually becomes rather serious before people band together to deal with it. Only when a considerable amount of disease could be traced to polluted water were sewage treatment and other anti-pollution measures developed. Only when motor accidents had taken an alarming toll did citizens insist on better roads, safety devices, and various accident prevention programs. Traditionally —and in the main this is probably one of mankind's happier traits —we do not go looking for trouble. Not until the trouble looms so large that it can no longer be ignored, do we find the incentive to band together and pool resources—neighborhood, city, state or national—to do something about it.

In dealing with the health hazards of ionizing radiation, unfortunately, this traditional approach cannot promise success. The effects of ionizing radiation are cumulative and irreversible. They are subtle and may become apparent only after long delay. If we wait until there are obvious signs of radiation damage, it will be too late to help the affected population or to decontaminate the polluted environment successfully. In this situation, prevention is not merely the desirable approach, it is the imperative approach.

Finding the proper incentive to stimulate preventive action, however, is not easy. To use fear as the incentive for action is not only unwarranted and undesirable but also useless. Panic or hysteria seldom results in constructive activity.

Since we do not yet know at what point the harmful effects of prolonged low-level exposure may outweigh the benefits of man-made radiation, we are suggesting as a public health maxim that all *unnecessary* radiation exposure should be avoided. Consequently, much of our efforts in public health thus far are being directed toward finding what exposure is unnecessary and how it can be avoided.

One of the major sources of radiation exposure today is the x ray. If we can reduce needless exposure to x ray without reducing its manifold benefits in the detection and treatment of disease, we have taken a significant step to reduce the dimensions of the radiation exposure problem. Considerable health agency activity in the radiological field is currently directed toward this goal.

For example, public health agencies for several years now have been making a concerted drive to eliminate the use of the fluoroscopic shoe fitting machine. There is absolutely no practical purpose served by this machine. Moreover, if a child uses it each time he gets a new pair of shoes, he gets a considerable dosage of radiation over the years, particularly since many of these machines deliver a scattered dose over a rather large part of the body. This is obviously a source of radiation that can be eliminated without the sacrifice of any beneficial result. The shoe industry has been cooperative. Shop owners, once they are fully informed of the

facts, seldom show any reluctance to remove these machines. The main reason this type of shoe fitter continues to be used is because there are not enough people, health officials or others, who have the information, the time, and the interest to work on the drive to eliminate it.

Another example of unnecessary exposure is the indiscriminate use of the x ray in tuberculosis surveys. When tuberculosis was more widely prevalent, community-wide mass x-ray surveys were justified. The early case-finding resulting from such surveys has unquestionably saved thousands of lives. There are still communities in the United States today where the prevalence of the disease makes mass x-ray campaigns desirable. However, there are other groups of people in which the disease is so rare that the mass x-ray approach is no longer the best case-finding method. Consequently, the Public Health Service has recently recommended a more selective use of this familiar procedure.

Interestingly enough, when this recommendation was publicly announced, a few reporters and commentators used the scare approach, implying that mass x rays were especially hazardous and that the Public Health Service opposed their use. This is an example of the emotional exaggeration that creates unwarranted fears and hampers constructive efforts to promote our health objectives. Any general reluctance on the part of the public to accept diagnostic x rays, when recommended by responsible authorities, would certainly be far more injurious to health than would the slight additional amount of radiation exposure. Let me hasten to add that the vast majority of papers and other mass media handled the story in a commendable fashion and made it clear that the individual x ray itself is not hazardous and that in areas where tuberculosis is prevalent, mass x-ray surveys are still a valuable case-finding technique.

A third example of the opportunity to reduce unnecessary exposure to x ray lies in the reduction of the radiation doses delivered in medical and dental examinations. It is an unfortunate fact that many of the more than 160,000 x-ray machines being

where we are and whither we are tending, we could better judge what to do and how to do it."

Baseline data are needed as a guide in the selection of reactor sites and as a gauge for determining how much and how rapidly radioactive waste from industry and from fallout is being added to the environment in any given area.

Such data may also prove helpful in the development of epidemiological studies. To date, studies of permissible radiation doses have been based primarily on observations of persons exposed to abnormally high radiation dosages and are, at best, estimates. In order to evaluate the public health significance of radiation, we need to devise means of measuring the far more subtle effects of prolonged, low-level exposure. Since the damage from this type of exposure extends over years and generations, the difficulties of the measurement task are too obvious to need delineation here. We place a high priority on research in this area. The information is needed not only to provide a better basis for establishing practical radiation exposure standards but also to relieve the public of those exaggerated fears which inevitably occur when one is dealing with unknowns.

The increasing public awareness and concern about radiation exposure has been focused primarily on the matter of weapons testing. A far more important potential source of environmental radiation exposure is the rapidly growing atomic industry. An upswing in the levels of radiation contaminants in the environment might be expected with wider and more diversified uses of radioactive materials. Operation of commercial reactors is a case in point. Consequently, long before the Shippingport atomic power plant began operating late in 1957, health personnel, both federal and state, were working closely with the designers of that installation. Radiation specialists from the Public Health Service and the Pennsylvania State Health Department participated in planning the installation and operation of the waste treatment system at the Shippingport reactor. This collaboration includes baseline studies of the receiving stream, the Ohio River system.

The Shippingport operation has given industry, the Atomic Energy Commission, and the federal-state health services an excellent opportunity to work out a practical pattern of cooperation in the interest of public health safety. This cooperation will continue, and operating experience will provide an opportunity to test theory against practice.

A pioneering operation such as this naturally commands the careful and personal attention of highly trained experts. But what is going to happen as the industry expands? Will the same precautions always be taken? Traditionally, state agencies and, in most states, health departments have assumed responsibility for seeing that every industry within their jurisdiction operates in such a way as not to endanger the health of the workers or of the other citizens of the community. Public health supervision of atomic industry is therefore not a totally new concept. It fits into the existing pattern of industry-health department relations. But it does present new challenges.

Will states and communities accept these challenges in time to be ready to meet the atomic industry problems that will soon be facing them? To date, there are radiological health programs in only a few state health departments. All states need them—and they need them now. To date only a few communities have any accurate idea of the sources and amounts of radiation to which their people are exposed. Every community needs to be taking this first step of radiation assessment.

It will not long be feasible for the public to rely entirely on the users of atomic energy for assurance of community health protection against radiation. As nuclear sources of power begin to compete with conventional sources, there undoubtedly will be severe economic pressures to lower production costs by cutting corners. The community must be in a position to assure that these economies will not be made at the expense of health considerations. The agencies traditionally charged with the protection of public health should be prepared to assume responsibility for providing such assurance.

These are a few of the public health aspects of radiation. To sum up, radiation presents three major problems to the public health profession. First, the public must be alerted to the need for greatly expanded radiological health programs which can provide security from fears that would hamper the constructive development of atomic industry and atomic medicine. Public understanding is basic because adequate radiological health programs require both legal authority and financial support on a scale possible only when there is general public acceptance.

The second big problem is that of trained manpower. Radiological health is a specialized field with concepts, vocabulary, units of measurement, and sensitive instrumentation of its own. With the growth of atomic industry there must be a corresponding growth in health personnel who have the training required to provide planning, surveillance and other services. However, since highly trained specialists are produced slowly and since there is much to be done now, the Public Health Service is providing practical training to the existing staffs of state and local health departments. This is done by courses and seminars designed to train trainers, people who can conduct similar programs in their own areas. In the last analysis, however, the corps of specialists needed as teachers and researchers must be increased. For this task, we look to our colleges and universities.

The third major need is research. I have touched upon some of the unsolved medical problems. The engineering field presents equally great research challenges. For example, we have yet to find a satisfactory method of disposing of high-level radioactive waste. The Atomic Energy Commission already has over 65 million gallons of radioactive waste buried in tanks in the earth. As the nation becomes dotted with nuclear energy plants—and this will happen faster than many people now realize—what is to be done with these high-level wastes? We are getting by at present with temporary expedients; we must seek long-range solutions.

From a public health standpoint, radiation is still a preventable health hazard. If we act now, I believe we can keep it so. In

recognizing, however, that all radiation is harmful and that its effects are cumulative and irreversible, the price of delay in the vigorous pursuit of research and control efforts might well prove to be intolerably high. Scientists have the opportunity to recruit the manpower, to conduct the research, and to interpret the problem to the public. All these are prerequisites to mankind's healthful enjoyment of the unbounded benefits the future holds in this atomic age.

Responsibilities of the Press*

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THE responsibility of the daily press in the affairs of man is to present the latest available information on current happenings in as accurate a form as limitations of time, space, format, and the unconscious prejudices of human reporters and editors will permit. Any discussion of press responsibility in reporting implications of low-level irradiation, particularly fallout, should begin, for reason of perspective, with the moment the subject of atomic energy burst into the press as a weapon of war in 1945.

The mantle of secrecy under which atomic energy was prepared for this spectacular debut persists to a degree today because of the cold war. The blackout of information over the years, however, has proved a handicap to the press and to the public in understanding fully the implications of good and evil that have come through splitting the atom.

In many other fields involving national security, it is possible to draw a rather sharp line between technological information and political or policy information. It is possible to be sympathetic toward protection of technical secrets while insisting that matters involving policy are in the public's interest. But the atomic energy field does not lend itself to this convenient separation. Here the technological and the political are intertwined. The atom, in this sense, is indivisible.

Since the function of the press is to present information, the press must stand in loyal opposition to any government agency

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that either necessarily or unnecessarily engages in secrecy. I believe that this is a desirable alignment in a democracy. In the continuing cross pull between secrecy and information, the press must array itself on the side of information because there will always be plenty of pressure on the side of secrecy. The greater danger is not that the press will reveal secrets of potential value to the enemy but rather that it will default in its obligation to maintain a balance of forces by constant pressure in the opposite direction. There is a growing tendency, I believe, to regard secrecy as a sacred cow to be accepted without question by the American people. At times, in our present climate, one is almost made to feel a sense of guilt in questioning security policies.

The press must always take the view that the issue is not how much can legitimately be withheld, but rather, how little must necessarily be withheld. If I read the attitude of American editors correctly, they believe that, no matter how accessible to information a man's position of office may place him, no matter how deep his understanding of the problem, no man is wise enough to judge himself and his acts before the people. However sincerely he may believe he is right and his critics wrong, however convinced he may be that the opinion contrary to his own should be made to conform in the interest of the democracy, he can never be sure that the opinion he is trying to stifle is a false opinion.

The entire philosophy has been crystallized by the American Society of Newspaper Editors in the phrase, "the right of the public to know." One of the presidents of that organization, Basil L. Walters, has punched it into even a terser phrase—the need to "audit government."

Newspapers have always looked behind closed doors, even though official guardians keep them out and assure them that all is well. Through tradition and heritage, it has been the business of the gadfly press to see for itself. True, poking and prying offer the opportunity for abuse, but perhaps this is the small price to pay for the type of vigilance that is offered by the American press.

Few presidents suffered more from attacks by the press than

Thomas Jefferson. Although he said bitter things in retaliation, he always maintained his belief in the essential service of the press in a democracy. After he retired from the presidency, he spoke fourteen words which have come to be almost a maxim: "Where the press is free, and every man able to read, all is safe."

Jefferson in all his wisdom could not begin to foresee the complexities and confusions of issues that would come to pass in his beloved country. During the last three or four decades, the expansion of this country's horizons and responsibilities, both at home and abroad; the growth of industry and finance, of population; the conflicts of labor and capital and of social and racial groups; the revolutions in transportation and communication; the developments in science, education, and culture, etc.—all have presented American newspapers with a challenge in reporting that is taxing their capabilities and their ingenuity. The introduction of the problem of radioactive fallout adds just another challenge. The task has not been made easier by the mystery and uncertainties that surround it.

There was a humorous anecdote circulating at one time about the AEC public information specialist who was visiting at Princeton on AEC business. During the course of the visit, he was introduced to Dr. Einstein, who inquired as to the young man's occupation. He replied he was a disseminator of public information for the AEC. "Oh, yes," replied Einstein. "Then you are practically unemployed."

The fact is that a very large quantity of information emanates from the AEC. Newspaper offices receive releases with regularity. Semiannual reports to Congress also contain a wealth of material. Many of the speeches of AEC commissioners are mimeographed and given wide distribution. Much has appeared in the press about the brilliant achievements in the fields of nuclear power and radioactive isotopes, to name but two areas. Much has been done by the AEC, and sooner than might have been reasonably expected, in advancing the cause of the peaceful atom. This also has been reported quite fully by the press. Yet the concern of the

public seems disproportionately focused on the piece of the informational pie that is missing. There is anxiety as to what this gnawing void holds in terms of its future, in terms of its life and death.

Psychologists tell us that fear of the unknown is a greater barrier to peace of mind than overt recognition of a known danger. Wars, fires, floods, and other disasters have shown that people can accept dangers calmly and courageously but tend to break up emotionally when faced with uncertainties that play cruelly upon the imagination. Nature abhors a vacuum, and human nature cannot tolerate a vacuum of understanding. If there are not facts upon which comprehension can be based, human nature will fill it in with rumor and misconception, if necessary. There is a ready willingness to believe the worst.

As psychiatrist John Spiegel of Harvard points out, lack of knowledge is all the more disheartening in this country that places unprecedented importance on knowing all the answers.

> We can't "muddle through" like the English without losing self-esteem. We can't bow to fate with Oriental calm. Our insistence on being able to blue-print a solution for every problem requires the means to tolerate an increased charge of anxiety whenever the problem resists solution.

I cannot say that the AEC has not maximized information compatible with national security. Only the AEC knows what information is in its possession. But I would like to suggest that perhaps more confidence could be instilled in the press and public through wiser timing of release of information. It has seemed to many in the press that the AEC, in discharging its responsibility of protecting vital information, is operating under an expedient policy of "too little, too late," of keeping the information under its official hat until it leaks out from other sources. Perhaps a policy that would judiciously anticipate the probability of informational developments and surmount them with forthright infor-

mation might do much to restore the public's full faith and trust in the AEC.

Representative Holifield pointed this up when he summarized the Congressional subcommittee hearing on radiation over which he presided in June 1957. He said it should not be necessary for a Congressional inquiry to squeeze information out of the AEC. It should not be necessary for Commission releases to come in forbidding technical form or driblets through speeches of Commission members or other high-ranking personnel. Time after time, he pointed out, there has been a long delay in publication of facts.

This was evident again in the story of radiation fallout at Bikini on March 1, 1954. The first ominous indication of the magnitude of the Bravo bomb came not from the AEC but from distorted versions that leaked out before the official announcement. A review of press files will show that the AEC's immediate report was only that of a "device" being exploded. About ten days later, the AEC mentioned radiation with the disclosure that 28 Americans and 236 natives unexpectedly were exposed to it and issued assurances that none was burned. Meanwhile, rumors began building up to the effect that the Bravo bomb was no ordinary device. A Marine corporal described his impressions from 300 miles away. Then came the startling information from a Japanese captain that the crew of his distant fishing vessel was burned by radioactive ash. The technological information began coming from Japanese scientists, including the fact that strontium-90 was found in the ash fallout.

It was not until February 15, 1955, that the full story was released to the American people by officials. Dr. Ralph Lapp, who has been one of the severe critics of government information policies, pointed out that "the year of secrecy was a year of paralysis with respect to civil defense." "Imagine what would have happened," he said, "had we been catapulted into a nuclear war with our civilizations completely unaware of the menace of fallout."

The February statement of the AEC was a reassuring one, but again it represented a policy of "too little, too late." There are indications that the AEC had known considerable about fallout before the Bravo test. According to Dr. Libby's testimony before the Holifield committee, fallout had been a subject of much interest to the AEC since the first atomic bomb exploded in 1945. Dr. Libby's testimony advised that, in 1952, the Rand Corporation had been given a contract to make an independent study of fallout. This culminated in the birth of Project Sunshine, which has developed a good deal of the data with respect to worldwide fallout. When these data were not forthcoming from the AEC, scientists outside the government began to speak out in terms of long-range hazard. Not until the issue was forced again were there statements from the AEC. Here once more was a suggestion to the public of a grudging reluctance to yield information.

Now to be more specific in the matter of press responsibility in the fallout problem. Perhaps a point of departure is the statement of Senator Hickenlooper, made during the hearing of the Holifield committee, that some press reports were sensational. Senator Hickenlooper even applied the phrase "hysterical journalism" to some of the stories he had seen, and he also spoke of headlines and stories "which seek, or which do, in effect, create fear and minimize the actual facts."

The word "sensation" has come to have a stigmatized meaning when applied to the press, but if one follows the Webster definition of a sensation, namely, something "producing excited interest or emotion," then the fallout story was indeed a sensation. It is news, sensational news, when grayish-white flakes swirl down from the skies on Japanese fishermen who had been considered to be in a safe zone. It is news that in contrast to the first bombs exploded, when radioactive debris came down comparatively quickly, the radioactivity of the superbomb may remain suspended in a stratospheric reservoir for possible worldwide consequences. It is news because the public had not been informed about these things before.

In the absence of proven facts with respect to implications and consequences, it is news to quote Dr. Selove, for example, to the effect that the danger may be exceeding permissible levels in some areas, or Professor Crow, to select another name at random, to the effect that there is no safe dose of radiation genetically. It is news to publish a statement by the British Atomic Scientists Association that H-bomb explosions may eventually produce bone cancers in 1000 persons for every million tons of TNT or equivalent explosive power, even though the statement cannot be proved, or disproved, in the present state of knowledge.

Similarly, it is news to quote Dr. Libby, as the press did frequently, that there is no cause for concern; or Dr. Eisenbud, who sees only a small safe level of radioactivity accumulating in the body from strontium-90 fallout.

When Dr. Schweitzer warned of harmful effects from bomb tests in a message to the Nobel Prize committee, and Dr. Libby challenged that, both stories were news. When Dr. Mark Mills and Dr. Harrison Brown were invited to speak on the subject before the American Society of Newspaper Editors and presented different points of view, both points of view made news. When Dr. Pauling released a petition signed by 2000 persons calling for an end to bomb tests on the part of all countries because of fallout hazards, it was news, and so was the challenge to his statement issued by Dr. Hildebrand and Dr. Beadle.

What we are really saying here is that in a confused and highly controversial area, the press can discharge its responsibility only by printing views on both sides of the question. This is not to say that newspapers can be edited with a yardstick to make certain equal space is given to each side. Information and news must be edited on the basis of a difficult-to-define standard known as "news value." This is dependent on many factors, including timeliness, prominence of event or subject concerned, reader interest, availability of space, and whether the information is actually "new" or has been said many times before.

While I cannot prove it, it might be a fair guess to say that if

all the stories on both sides of the question were told, the result would represent a fairly even division of space. It of course adds to the reader's turmoil to see two antithetic stories in the same newspaper on successive days or even in the same issue, and this will often lead to the comment by a man on the street, "Why can't the press make up its mind?" Of course the basic source of confusion is, as Professor Barry Commoner stated: "The public is accustomed to associating science with the truth and is dismayed that scientists appear to find the truth about fallout so elusive."

Until the issue is resolved the responsible newspaper can only continue to print all responsible views. Whether the stories be classed as hysterical or sober, understated or overstated, to some extent will depend on the preconceived position of the reader.

Out of the free-for-all of fact and opinion, presented in the daily press, usually emerges, when needed, the basic information required by a democracy to govern itself. In *Freedom of Information,* the editor, Herbert Brucker, recalls the words of Milton way back in 1644:

> While truth might assume more shapes than one, we could yet find it and make it serve our needs.

For practical purposes, he went on:

> Finding the truth is simple. All you have to do is let all versions fight it out among themselves, and let all men, no matter how highly colored an opinion they might have as to what is the truth, utter it without hindrance.

And as Mr. Brucker adds:

> In this country, we want no court of the star chamber to say beforehand what is truth and what is error and to permit for printing only that which they certify as the truth.

The Anglo-Saxon society has gotten where it is by permitting substantially all facts and opinions as to what are facts to compete openly in the market place for public acceptance. By

and large, the truth, somewhat battered but still recognizable, eventually emerges triumphant.

I think we ought to have more news rather than too little news, more criticism rather than no criticism at all.

Human institutions are rarely perfect, and the press is no exception. But perhaps, in the midst and welter of this confusion, some benefits already may have emerged from press stories and the work of other people, including public health people. As Dr. Price pointed out, there is greater understanding on the part of the public and the profession of the evils of overuse of conventional x ray. There is interest in preventing exposure of persons without some useful purpose being served.

The press has obstacles in presenting information about low-energy radiation and high-energy radiation and all areas of science. One of these is the background of the reader who lacks education and training necessary to absorb fully the complexities of technical information. Another is the difficulty in translating the precision of science into a correspondingly accurate lay language. Where scientific accuracy is carried out to perhaps five decimal points, the newspaper report must settle for round figures.

Another obstacle is the overenthusiasm of the scientist who seeks objectivity but is unconsciously accentuating the positives and minimizing the negatives of his research work or his opinions and thereby misleads the reporter who is not necessarily qualified to evaluate the research. And then there is the creative scientist who may be so constituted that he cannot conceptualize and explain simply what he is trying to say.

Certainly another limitation is the format of the newspaper, with its sharp headlines that punch a story into four or five short words that may strip the scientific report of all qualifying material and reservations.

Perhaps all this would indicate that the press is not an adequate medium for conveying the word of science. But as long as newspapers continue to serve as the public instrument for presenting

the day-to-day story of mankind, with its hopes and fears, strengths and frailties, accomplishments and defeats, science will continue to be reported in the press. So it becomes incumbent upon all of us to seek methods by which the scientist and the newspaperman can work closer. Too many scientists still refuse to descend from ivory towers to cooperate with the press. Such cooperation would yield mutual benefits. It would help curb irresponsible reporting by the press and bring about better public understanding of the scientist who today is alternately lionized and feared.

As Dr. Brock Chisholm, the psychiatrist, says: "No one can remain acceptable if separate from other people. From the point of view of other people, he [the scientist] does not belong. He is some kind of a stranger who is unpredictable and cannot be trusted. The scientist must make himself a human being if he is to be understood by the people of the world."

Only through teaming of knowledge as provided by science and communication of that knowledge to the public by the press and other popular media can the people learn to understand the intellectual force that is science and to use it properly so that it may serve us and enrich our appreciation of the world around us.