Science in the News

Atomic Radiation Hazards: Congressional Hearings on Radiation Standards

For the past two weeks the Joint Congressional Atomic Energy Committee has been holding hearings on the touchy and difficult problems connected with the health hazards of atomic radiation.

The committee has held similar hearings on half a dozen occasions in recent years, covering fallout, radiation waste disposal, and similar topics. As in the case of the present inquiry, a principal purpose has been to compile a detailed record, in comparatively nontechnical language, of the thinking and the results obtained by several dozen of the leading scientists professionally engaged in work with radiation problems.

The committee has not attempted to minimize the dangers of radiation. In fact Congressman Chet Holifield (D-Calif.), who has been chairman of the hearings, has on several occasions used leading questions to get witnesses to amplify remarks which, if taken out of context, might seem to minimize the dangers. Nevertheless, the committee and the expert witnesses it has called to testify are pretty clearly concerned about the sometimes exaggerated public reaction to the whole business.

Public Reaction

The reaction is understandable; it stems from the nature of the problem, which is, to the layman, concerned with things mysterious, invisible, largely unavoidable, and associated at their source with atomic weapons and in their results with such things as leukemia, bone cancer, and genetic mutations. What the committee is trying to do, aside from keeping itself informed on a subject which is part of its legislative responsibility, is to allay excessive fears by making detailed information available to the public. The committee hopes that this will at least help put the problem in proper perspective.

The level of average radiation exposure today, the committee was told, is estimated to be about equal to the natural background radiation with which man has always lived. The witnesses made it clear that the best figures are only estimates, but that nevertheless the fact that a number of independent U.N., American, and British groups have all arrived at substantially the same figures makes them seem quite reliable.

A study prepared for the National Academy of Sciences, and these figures are in close agreement with those reached in other studies, indicates that, taking the level of natural radiation as 1, the level of man-made radiation would be about 0.9. Most of this (85 percent) stems from medical and dental diagnostic x-rays, and an additional 8 percent from medical x-ray therapy. Nothing else seems to amount to more than 1 percent of the total man-made radiation. Three of these minor sources are of special interest to the public: internal isotopes (mostly strontium-90 fallout plus certain other isotopes which tend to be assimilated into the body), incidental radiation from television sets, and luminous dials (mainly on wristwatches). Each of these sources amounts to about 1 percent of the man-made total.

The fallout figure, of course, is based on present contamination. If large-scale weapon testing in the atmosphere were to be resumed it would increase substantially. But at this time neither the U.S. nor Russia has shown the slightest indication of resuming such testing. The negotiations at Geneva are concerned with underground and outer space testing, neither of which produces any fallout at all.

How dangerous is the present level of radiation? No one knows the answer to this, although this fact, in itself, suggests that the danger may be small compared to, let us say, the danger of being killed in an auto accident. At this time, the committee was told, a clear cause and effect relationship between radiation exposure and body damage has been established only for large doses of the order of many hundreds and more times background radiation.

Even here most of the data are based on cases where the doses were received in an "acute" form—that is, in the form of a massive dose delivered in a short period of time. At lower rates, but still much above the average population level, there begins to be some statistical evidence linking, for example, an increase in leukemia incidence to the profession of radiology, where the practice of the profession necessarily leads to chronic exposure to levels much above the average. Studies in this area, the committee was told, while sometimes inconclusive, tend to show that radiologists have a slightly lower life expectancy than medical specialists in general, but still slightly higher than general practitioners. Getting down to normal levels, there is not even any significant amount of statistical evidence suggesting damage. The witnesses before the committee nevertheless felt it had to be assumed, for safety's sake, that such marginal radiation is harmful. But apparently the level of harmfulness at anything near present levels of average exposure, if it exists at all, is low enough so that it takes careful statistical analyses of large numbers of cases to discern any effect.

Problem of Statistics

The problem of statistics raises several questions close to the heart of the over-all problem. In the first place the available studies give information mainly on adults, and there is some reason to believe that these data may not be strictly applicable to children, and stronger evidence that they are not easily applicable to unborn children, particularly in the first few months after conception. Fallout tends to be disproportionately high in certain latitudes and its effects still more disproportionate under certain soil conditions and where the prevailing diet is weighted toward dairy products. The major figures of average exposure to medical and dental uses of x-rays are obviously not distributed evenly among the population. All the x-ray therapy is done on a rather small group of people, and even the general diagnostic x-rays vary widely in the incidence on different individuals.

None of this unevenness of distribution invalidates the consensus of the

testimony summarized here. They are taken into account in the detailed studies that are being made. But they do point up the complexity of the subject and show how statistics carelessly used can be thoroughly misleading.

Individuals versus Averages

Even if one could assume homogeneity of distribution, there was still a great deal of discussion before the committee over how one ought to regard such over-all statistics. There was wide agreement among the witnesses that, measured in terms of averages, anything close to present exposure levels is probably quite insignificant—a matter of lowering average life expectancy by a day or two. This unquestionably is more than balanced by the increase in life expectancy stemming from the use of medical x-rays and other types of useful radiation. But measured in terms of individuals the figures are much less easy to ignore. The committee heard estimates, for example, that an extra 2000 leukemia deaths are likely to result from present levels of radiation. Looked at in terms of such absolute rather than average figures it becomes clear that any step that reduces the amount of radiation exposure is likely to save lives even though no one will ever be able to point to any specific individual and say that "his life was saved."

The dilemma the scientists face is how to set standards in this field. It is generally accepted, though not proven, that there is no dosage level below which radiation becomes harmless. It is assumed that any increase in radiation, whether natural or man-made, will carry with it some increase in damage, even though this damage may not be detectable even in the most elaborate statistical studies. Even where the damage is fairly calculable (by assuming linearity and the nonexistence of a threshold as was done with the leukemia estimates given above), there is no special point at which it suddenly becomes clear that drastic measures are called for to prevent any further increase. Roughly 40 thousand Americans die in auto accidents every year, a fact which leads no one to recommend that automobiles be outlawed. What is done is to formulate standards for drivers, for highways, and for the cars themselves to keep the level down to a point which society seems to be willing to accept and, further, to minimize the death rate below the acceptable level.

In the case of radiation analogous reasoning has led to two general principles: first to try to set standards, necessarily arbitrary, of acceptable degrees of risk in various situations; and second to look for all reasonable ways to minimize radiation even for cases which are well below acceptable level in order to minimize damage within this acceptable range. Given the lack of precise knowledge, these standards, for the population at large, tend to be set in terms of natural radiation. Virtually everyone who has studied the situation agrees to this principle, the reasoning being that, since man has always lived with natural background radiation without any disastrous effects, a level of man-made radiation of the same order of magnitude should be relatively acceptable. And although this assumption is unproved, and presumably will remain so for several generations, it does, as noted earlier, tend to be confirmed by the limited statistical and clinical data now available. In line with this reasoning, the current standards set by various groups range from 1 to 2 times the background radiation as an *average* for the population at large. It is assumed that this will not lead to the exposure of large numbers of individuals to more than 5 times this level and this, it is believed, still leaves a substantial margin of acceptable risk.

Actually these figures simplify the situation considerably. They give an accurate enough picture for the general reader. But in fact, an extremely complex variety of standards have actually been set, specifying guidance levels for various situations, types of hazards, and for exposure of different parts of the body. Substantially higher levels have been set for special occupational groups, in the same way that society allows miners, chemical workers, construction workers, and other groups to accept hazards which would not be acceptable for the population at large. Many of these standards are specified in recent publications of the Federal Radiation Council, which is chaired by Arthur Flemming, the Secretary of Health, Education, and Welfare. The committee has heard detailed presentations of what is being done to see that these standards, once set, are enforced. A report of the problems of enforcement will appear here next week.

Aid to Education: Bill Passes House, But Outcome Still in Doubt

The House of Representatives climaxed a 10-year effort to pass a federal aid to school construction bill last week, but it was difficult to tell who had actually won the battle. There is considerable doubt that the bill will ever reach the President's desk, and more doubt about whether, if it reaches his desk, it will be in a form he will be willing to sign.

The bill provides for $325 million a year in federal aid for each of four years, with the states and localities required to match the government grants. The grants would be prorated among the states on the basis of numbers of school age children. They would provide enough money to build about 50,000 classrooms; the officially estimated shortage is 132,000 classrooms. In the Senate, a much broader billion-dollar-a-year bill was passed in February.

Those who are leery of federal aid, as is the President, tend to be at best passively in favor of a modest bill granting emergency assistance primarily to the neediest states. More commonly they are actively opposed to any bill on the grounds that it will be the opening wedge for a much more massive program in the future. In this contention they are almost certainly correct since a large, continuing program is exactly what most of those in favor of federal aid feel is needed.

Powell Amendment

Supporters had hoped that the House bill, a compromise which they felt the President might sign, would be accepted by the Senate, thus avoiding the need for sending the bill to conference. This possibility was eliminated when the Powell amendment was attached. The amendment, heavily backed by House Republicans opposed to any federal aid bill, provides that the grants should not be used to build segregated schools. No Southerner who would like to be reelected could vote for a bill containing this provision, which means that such a bill cannot get through the Senate, where a filibuster can be used to prevent a vote.

This means that the bill will have to go back to the House Rules Committee in order to get to conference, and the majority of the Rules Committee is opposed to federal aid.