

REPORT OF THE COMMITTEE ON ENVIRONMENTAL HAZARDS

STATEMENT ON THE HAZARDS OF RADIOACTIVE FALL-OUT

IN A 2-day workshop meeting on January 22-23, 1962, the Academy's newly-formed Committee on Environmental Hazards considered the problems posed for pediatricians by fall-out of radioactive materials on this country. This report has been kept brief that it might promptly be placed before the members of the Academy for their information and guidance. The excerpts from letters that have come to the Committee show the type of questions that parents are bringing to physicians. The statement of the Committee attempts to provide some guiding principles in the light of present conditions.

The Committee has carefully reviewed the organization of facilities within the U.S. Public Health Service, the Atomic Energy Commission, and other established agencies for monitoring fall-out in this country. It has also reviewed data on the duration, the amounts, and the hazards of radioactive iodine-131 and strontium-90 in fall-out, data and reports of new processes for removal of radioactive strontium (Sr^{90}) from milk, as well as reports on long-term studies of Japanese survivors of Hiroshima and Nagasaki and people of the Marshall Islands who were exposed to fall-out from nuclear weapons testing.

MONITORING FACILITIES

Within the United States there are two agencies specifically charged with the chief responsibility for analysis of the atmosphere, water, soil, and foodstuffs for radioactivity from fall-out. These are the U.S. Public Health Service and the Atomic Energy Commission. The surveillance maintained by the U.S.P.H.S. in co-operation with state and local governments includes a nationwide "early warning" network of

about 60 stations that monitor air pollution, 60 stations monitoring radioactivity in milk, and a network of more than 300 stations for monitoring general air and water pollution. The Food and Drug Administration has expanded its program and monitors foods from all parts of the country as well as imported foodstuffs for radioactive contamination. In addition there are extensive special purpose radiation surveillance facilities of the AEC and the Departments of Defense, Commerce, and Agriculture. The information obtained from these programs is regularly available, and the Committee reviewed summaries of data from these sources. Besides these duly constituted monitoring stations, numerous laboratories engaged in low level counting procedures used in nuclear medicine provide an independent check both on environmental contamination and body burdens.

In addition to the establishment and maintenance of monitoring stations, the government has widely encouraged research on the fate of fall-out constituents in relation to man. Many of these facilities contribute data independently gathered relating to the body burden of both children and adults.

HAZARD OF STRONTIUM-89, STRONTIUM-90, AND IODINE-131

Particular attention was devoted by the Committee to the hazard of Sr^{89} , Sr^{90} , and I^{131} in milk. Sr^{89} occurs in the same general fall-out pattern as Sr^{90} , but having a relatively short half-life of 51 days, it has almost entirely decayed before it leaves the stratosphere. Radioactive Sr^{90} is an element that ultimately collects in bone, if

it has not been excreted. It emits beta particles, so its effects are extremely localized. The exposure of the gonads is transient and extremely small. The present Sr^{90} content of milk is less than that which is believed to be capable of inducing recognizable deleterious effects in infant, child, or adult during average lifetimes. Nevertheless, laboratory methods for the removal of Sr^{90} from milk are now being tested. If it becomes necessary, these can probably be developed through pilot stages to commercially applicable procedures. The basic ideas used in these methods are simple and practical, although their application could not be included in milk processing without significant increases in retail costs. Most importantly of all, it should be remembered that approximately 80% of Sr^{90} ingested will be immediately excreted so that the body burden increases more slowly than does the environmental contamination. The cow thus eliminates 80% of environmental strontium from its milk. The additional safety factor that mothers can provide through breast feeding is one to be carefully pondered by pediatricians.

For I^{131} the hazard of a possible carcinogenic action on the thyroid gland exists through the unusual capability of the thyroid to concentrate this element. The present level of concentration in foods, liquids, and atmosphere is also well below the levels at which alerting of the population is required by governmental standards, which are very conservative. Because of this fact, the question of blocking doses of stable iodine is not at this time pertinent. It should also be recognized that because of the short half-life of I^{131} (8 days) the problem of radioactive contamination of food by this element is limited in time to about 2 months following any excessive contamination of the atmosphere. Before prophylactic administration of carrier iodine as a blocking agent, the very real probability of developing iodism in large numbers of children by well-intentioned but uninformed practitioners must be weighed against the very hypothetical

gains to be achieved at present levels of exposure.

The National and International Committees on Radiation Protection are in general agreement in relation to radiation effects on biological systems. On the basis of these effects they have established limits of exposure or body contamination which, on the basis of present knowledge, are tolerable by man or child for a lifetime experience, since the age of the individual is taken into account in arriving at the limits stated. Should I^{131} or Sr^{90} in the environment significantly increase, those agencies charged with protection of the population will inform those groups responsible for the development of appropriate recommendations and procedures.

The following excerpts from letters that the Academy has received relative to this problem show the type of questions which parents in many parts of the country are bringing to physicians and in turn the medical problems which this statement by the Committee attempts to answer in the light of present conditions:

"Will you be kind enough to send me some information on the present opinions concerning health dangers from radioactivity in commonly used foods. I would be especially grateful for information about the dangers from strontium-90 in milk and any recognized method of precaution."

"Last weekend an article appeared in one of the Sunday supplements regarding the use of supplemental iodine to be given to children. The mother of one of my patients phoned me and wanted to know if I had any recommendations regarding this. Since this seems to be something new in the idea of preventing damage due to radioactive fall-out, I would appreciate it if you would refer this letter to one of your committees for an opinion so that I may advise the mother accordingly."

Academy members should be assured that the Committee will be receptive to inquiries or further questions on this or related areas and that the Committee will endeavor to provide prompt and continuing reporting to the members of the Academy as to measures recommended for the better protection of the health of children.

GENETIC EFFECTS

The very careful and exhaustive studies carried out by the Atomic Bomb Casualty Commission on the populations of Hiroshima and Nagasaki in Japan have thus far failed to detect any genetic effects that could be attributed to radiation exposure from the bomb explosions. Some increase in leukemia has been noted among the very heavily exposed group, but otherwise discernible effects have been strikingly lacking.

The population of some atolls in the Marshall Islands is the only group of people who have been exposed to heavy bomb fall-out in addition to the stratospheric delayed fall-out. The people thus exposed have been carefully examined by physicians of the highest competency each year, and the health status of the exposed persons is compared with a nonexposed group of about comparable size. In the ensuing 8 years no genetic effects, no effects on pregnancies, and no effects on disease incidence have been observed in this care-

fully scrutinized group of people. This experience is a counterpart of the kind and intensity of exposure that might be expected. The experience to date, including that of the Japanese study, suggests that the hazards have been fairly correctly estimated as very low. However it should also be pointed out that "current scientific standards of genetics demand a much larger volume of relevant information than is presently available for a critical assessment of the hereditary effects of radiation in man."^{*}

COMMITTEE ON ENVIRONMENTAL HAZARDS

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^{*} Report of the United Nations Scientific Committee on the Effects of Atomic Radiation. UN General Assembly, Official Records; Thirteenth Session, Supplement 17 (A/3838).

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