

said he hoped he would not have too much opportunity to exercise his talents in this field; it was to be hoped cases of radiation injury would not be frequent or numerous. In any event, all cases were not identical and the treatment would have to vary. Besides, there were cases which did not require any treatment and others in which treatment would be of no avail. The Curie Hospital, therefore, had no fixed programme of treatment. Dr. Hurst said that the method of treatment employed in the case of the Yugoslav patients had not been attempted in any other case of this type. In the case of the Oak Ridge accident, the people affected had received a somewhat lower dose and it was not thought desirable to try treatment of this type.

In other cases in the United States the exposure had been so large that such treatment would have been useless.

Commenting on the significance of the experiment in general, Dr. Hurst said that since the advent of atomic energy there had been considerable concern about the effects of radiation on man but so far there had been little opportunity to establish a quantitative relationship between amounts of radiation and their consequences. Every opportunity should be taken to ascertain this relationship so that one could determine the levels of tolerance that would govern various operations in the field of atomic energy.

RADIATION SAFETY MEASURES

Safety in atomic operations has an exceptional significance because the hazards involved are of a rather special character. While normal industrial hazards may well be catastrophic, their nature is well known and they can be controlled by methods which are relatively simple to formulate and enforce. The hazards of nuclear radiation which are inherent in most atomic energy activities are much more complex; not only their effects but their very presence are sometimes likely to remain unnoticed until harm has been done. Adequate insurance against these hazards can be secured only by a set of special measures of safety.

The International Atomic Energy Agency has, from the very outset, regarded radiation safety as one of its primary responsibilities. The potential contribution of atomic energy to human welfare is now universally recognized, and it is inevitable that there will be a steady expansion of activities to derive its benefits. But it would be a sad irony if this progress were attained at the cost of human health and safety. While assisting the development of the uses of atomic energy for economic and social progress, the Agency must, therefore, also try to ensure that it does not constitute a threat to man's health and heredity.

While this may be too wide an objective to be fulfilled by the efforts of any single organization, the Agency must at least see to it that the activities to which it lends its assistance are carried out without causing any avoidable damage to life and property. And the important thing to remember is that however insidious the dangers of nuclear radiation, much of the possible damage is avoidable through the adoption of appropriate measures of safety.

The sources of danger, of course, cannot be eliminated. The emission of ionizing radiations is governed by an unalterable natural law; the substances which emit them are indispensable in atomic operations; and there is as yet not a great deal that one can

do to reduce or substantially modify the effects of the radiations. But what one can, and must, do is to ensure that people are not exposed to these radiations in a manner or to a degree that is likely to be harmful.

This is the basic purpose of radiation safety regulations. The precise formulation and enforcement of these regulations, however, depend upon a large complex of technical and organizational considerations. From the technical point of view, it is necessary to study the behaviour of various radioactive substances, to determine the levels above which the radiations are likely to be harmful, and to devise measures to keep the levels of exposure with an adequate margin of safety below the threshold of danger. On the organizational side, however, one must not only ensure that the technical regulations are adequately observed but also see to it that in so doing, an undue restriction is not placed on the development of peaceful atomic energy work. After all, if atomic energy is to be put to any practical use, radioactive substances cannot be isolated from the arena of human activity, and some kind of contact is inevitable at every stage of production, storage and use. The aim, therefore, is to evolve a system under which these operations can be carried out effectively with a minimum of direct contact, keeping the levels of exposure as far below the threshold of danger as possible.

Special Responsibilities

Many national and international organizations are concerned with this problem, but inevitably IAEA must assume certain special responsibilities in this field. Under its Statute the Agency is authorized to establish or adopt standards of safety for the protection of life and property and to provide for their application to operations to which assistance is rendered by it or at its request. The Agency may also, if so requested,

provide for the application of these standards to operations under bilateral or multilateral arrangements or to a State's own atomic activities.

The first task in establishing a set of regulations, norms and codes of practice is to determine the maximum permissible levels of radiation exposure and fundamental operational principles. In establishing these basic standards, the Agency is guided by the recommendations of the International Commission on Radiological Protection which has been dealing with the problem for a number of years. In addition, the Agency is establishing certain detailed standards for particular fields of operations; it has, for example, already published a manual of safe practice in the handling of radioisotopes.

The standards themselves will be of little value unless adequate arrangements are made for their application to actual operations. Another important task, therefore, is to lay down procedures or measures for the observance of the standards. This has now been accomplished with the formulation of a set of rules for the application of safety standards to operations assisted by the Agency.

These procedures, contained in a document recently approved by the Agency's Board of Governors, will enable a State asking for Agency assistance to consider in advance the nature of the Agency's safety standards and the scope of the safety measures. They will also help the Agency in examining a request for assistance from the safety point of view and determining the relevant standards and measures.

Application of Safety Standards

In general, safety standards will be applied to any Agency-assisted operation which may lead to a radiation hazard. The standards may be those established by the Agency itself or those proposed by the State concerned and approved by the Agency as adequate and effective. Pending the establishment of the Agency's own standards of safety, the adequacy of standards proposed by a State will be judged in the light of relevant regulations laid down by the United Nations or the specialized agencies or by the International Commission on Radiological Protection.

When asking for assistance, a State will provide the Agency with a description of the operation in question, and if appropriate, a statement of the safety standards that it proposes the Agency should apply. On this information the Agency will determine whether safety standards are to be applied, and if so, whether the standards proposed by the State are adequate. The document also specifies the circumstances in which safety standards will not be applied.

Principal Procedures

The measures to ensure the observance of safety standards are to be specified in the relevant agreement for the provision of Agency assistance to a State. The main provisions for safety measures can be broadly summarized as follows:

The State will submit an annual report to the Agency containing (a) a list of the radiation exposures of people in excess of the safety standards applied, and (b) a statement of the types, amounts and mode of radioactive waste disposals and release of radioactive materials into the environment. The State will also notify the Agency within 48 hours of the detection of a major incident*, involving the exposure of any person to 12 rems or more of ionizing radiation, to be followed by a detailed technical report.

In addition, certain special provisions may be required for operations which involve the use, storage or processing of radioactive materials in excess of certain specified quantities or the existence of radiation levels that might lead to the exposure of a person to more than 3 rems in 13 consecutive weeks. In such cases, the Agency may require the State to submit to the Agency (a) all facts necessary to evaluate the potential radiation hazard, (b) details of the design of equipment and facilities, the operating procedures, the method of waste disposal and the planned safety precautions, and (c) the administrative system proposed in connexion with the application of safety measures.

In such cases, the Agency will also be authorized to conduct up to two inspections per year. Besides, it will be authorized to inspect all operations to which safety standards are applied upon a report by the State of a major incident or on specific instructions by the Board of Governors. Arrangements for inspection will normally be embodied in the agreement between the State and the Agency for the provision of assistance.

The Agency will continue to sponsor and conduct research to improve safety standards and measures, and this may lead to the modification of the provisions from time to time. The present provisions will be reviewed not later than January 1962.

* The rem is the unit of ionizing radiation which has approximately the same biological effect as one roentgen of X-rays.