HEALTH PROTECTION OF MAN IN THE FACE OF NUCLEAR HAZARDS

Problems of protecting the health of individuals, the population and the environment are rightly among the most important preoccupations of the public and the powers that be. The problems are many and the possible risks involved in the use of nuclear energy in all its forms are high up on the list. The recent oil crisis too, has made the authorities put greater emphasis on nuclear energy. This new development implies the need for adequate measurement and control of the extra hazards to which man and the environment could now be subjected.

To anticipate a danger, and nullify its harmful effects or control them so as to keep them down to an acceptable level means, above all, knowing and identifying, through research, the various links in the chain, very long sometimes, and sometimes most direct, connecting nuclear energy and man. Since 1960, the six and then the nine Member States of the Community have been working together to devise and carry out a Biology and Health Protection Programme. The aim of this programme is to discover the effects and hazards of radiation and nuclear energy and to develop the measures of protection that are needed.

The current programme is the third of its kind and covers the period 1971 to 1975. In addition to the section on radiation protection, for which a Community budget of 18 886 million u.a. was allocated (1 u.a. = approx. US $1), it also includes a supplementary programme dealing with the "application of nuclear techniques in agricultural and medical research", for which 5 610 million u.a. have been allocated.

Some outstanding results have been obtained under this Community programme. We will limit ourselves to a few examples of the work done and the results obtained, which have all required several years of work:

Of special interest in the assessment of radiation hazards are investigations into the long-term effects of ionizing radiation on human beings. Certain diseases have in the past been treated by means of radioisotopes and are still so treated today. The groups of patients involved have been examined in large-scale epidemiological studies, and are still under observation. These studies have yielded revealing indications of the extent to which radiation effects are dependent on the age of the patient, and on the linkage between effect and dose.

The transfer and build-up of radioactive elements in the human food chain have also been studied in various regions of the Community. In a number of limited areas, it has already proved possible to produce a remarkable synthesis of these results. Numerous factors, such as human biology, ecology, soil science, agricultural methods, and the method of feeding have all to be taken into account.

To protect people working in the nuclear industry, who, by the nature of their work, are exposed to the risk of assimilating radioactive elements, a study was made of the behaviour of such elements - particularly plutonium, the transuranic elements and fission products - in human metabolism, and their various effects noted. We now know more about the peculiar significance of the physico-chemical state of these elements in terms of their toxicological effects. Further research is however necessary.

The treatment of cases exposed to severe radiation dosage, such as might arise in nuclear accidents, has been studied jointly in a number of institutes. Haematology and immunology play a particularly important role here, and investigation has been made of the possibilities of bone-marrow transplants, since this can sometimes save the life of a person who has suffered radiation injury.

In the area of primary effects, study is being made of the basic biological molecules to discover the changes induced by radiation in the molecule itself, since this is the starting point for radiation damage in the organism. Elucidation of such changes will be an important aid towards the treatment and prevention of radiation damage.

Given the increased pace of development in the nuclear industry as a result of the energy crisis, what is the outlook as regards radiation protection? As time goes by, innovations or improvements will certainly continue to raise the safety factor in nuclear industry. Three problems are particularly important in this connection namely, the construction and control of the reactors themselves; the transport of irradiated fuel; and the storage of highly radioactive waste. For each of these, various solutions are possible and "optimum safety" arrangements apply.

The care taken in the matter of safety in the nuclear industry has so far meant that it is one of man's safest ever industrial activities. There is absolutely no indication to show that it will not remain so in future, under normal operating conditions, as long as the principles governing safety at present are observed. On the other hand nothing can ever totally eliminate the possibility of accidents occurring - human error and technical faults will always represent unknown factors, whose effects in theory could become a cause for concern. Once again hazards of this type must be objectively assessed and the knowledge needed to avoid them, bring them under control or reduce them must be acquired.

The nuclear industry is not the only form of activity introducing the factor of "radioactivity" into man's daily life. The medical applications of ionizing radiation for instance have results which the public is often little aware of. No one would dream of doing without the many radiological and radiotherapy techniques that medicine employs and that have proved to be irreplacable. But research should make it possible to perfect methods of reducing exposure and dosage. This is also one of the aims of the Community research programme.