



Modification of Radiosensitivity of Biological Systems

Radiotherapy is the most common treatment of cancer. It is also practised in combination with chemotherapy or immunotherapy. Although many cases are successfully treated, failures in local control do occur and even a modest improvement in the relative radiosensitivity of tumour cells would result in a substantial therapeutic gain. In addition, the presently practised fractionated dose schedule for cancer treatment usually extends over a long period causing hardships and economic difficulties to patients in developing countries who often have to travel long distances for their treatment. It would therefore be desirable to shorten the period of treatment. Radiosensitizers offer some hope in these directions.

Harmful effects of ionizing radiation in biological systems, including mammals, can be diminished either by pretreatment with certain chemicals or by selective modification of endogenous protective substances. Such radioprotective substances may prove useful to patients exposed to heavy local doses of radiations for tumour treatment or moderate radiation doses during diagnostic and clinical investigations. These may be useful also for healthy people who may have to be exposed to heavy total body irradiation, for instance, during emergency operations.

The International Atomic Energy Agency, therefore, convened an Advisory Group meeting in Vienna during December 8–11, 1975, where 26 scientists from 20 countries participated to discuss "Modification of radiosensitivity of biological systems" by chemical means.

On the basis of results presented, radiosensitizers could be classified into four categories: hypoxic cell sensitizers like electron affinic and membrane specific compounds; analogues of DNA precursors either incorporated into DNA or otherwise; radiation activated toxic compounds; and factors which modify cellular regulatory processes such as inhibitors of repair, and natural protectors, intercalating compounds and hyperthermia. Among these, the electron affinic compounds like nitroimidazoles hold the greatest promise in radiotherapy. Preliminary clinical trials performed on human patients in U.K. with one such compound have yielded encouraging results. It became evident that radioresistance can be substantially decreased by modifying endogenous systems and clinical trials with melanoma patients performed in Poland have shown improved results. Other radiosensitizers are still being tested using *in vitro* systems and some of these may soon be subjected to clinical trials.

Most of the radioprotective substances have proved too toxic for human systems. A few new compounds such as phosphothioates and derivatives of mercaptopropylglycine which are less toxic, hold some promise. Whereas considerable efforts have yet to be made on the biochemistry and pharmacology of these compounds, they may prove useful for protection

against radiation injury and late effects like induction of leukaemia, cancer or nephrosclerosis. Since the majority of radioprotectors are effective only for a limited duration, this situation may have to be improved by pharmaceutical combination to ensure prolonged retention of the protective compounds in the human body.

Successful exploitation of radiosensitizers and protectors in radiotherapy depends on selective effect of these compounds on tumours and normal tissues respectively. Whereas certain radiosensitizers have reached the stage of clinical trials, the development of radioprotectors is not so far advanced. More basic research is needed on radioprotectors before clinical trials can be attempted.

It is planned to hold another Advisory Group Meeting in 1977 to review the progress made on clinical trials with some selected radiosensitizers and protectors. The Agency has also initiated a Coordinated Research Programme in this field, in which 10 institutes from 9 Member States, the Federal Republic of Germany, India, Japan, Poland, Romania, Sweden, the United Kingdom, the United States of America, and Yugoslavia, are participating.



INTERNATIONAL SYMPOSIUM, VIENNA, 2-6 FEBRUARY

The meeting on "Nuclear Techniques in Animal Production and Health as Related to the Soil-Plant System" was attended by 90 participants from 28 countries and representatives from 9 international organizations.

Improvement of Animal Production through Research using Radioisotopes and Radiation

High birth rates coupled with greater longevity continue to increase the world's population, especially in the less developed countries. The prevention of undernutrition and ultimately starvation will only be averted by increased food production and more efficient use of that food. At the same time people who have largely subsisted upon plant food diets and whose standards of living are rising, want to increase the use of animal products in order to upgrade their diets. To provide this high quality food animal scientists must find ways of increasing the supply especially in the less developed countries. Since most of the available pasture lands are presently being fully utilized or overgrazed, improved efficiency of the present herds and use of agro-industrial wastes are the only methods left to increase production significantly.