RESEARCH PROJECTS IN RADIOBIOLOGY AND RADIATION PROTECTION

Of the research projects sponsored by the International Atomic Energy Agency quite a large number are concerned with the biological effects of ionizing radiation. That itself, of course, is a very wide field covering such subjects as the nature and mechanism of radiation damage, genetic mutations, the varying radiosensitivity of different organisms, ways of modifying the natural sensitivity or resistance, and biological and chemical means of protection. In all these branches of enquiry, the Agency has awarded research contracts to scientific institutes or laboratories in different countries.

Although the specific topics being investigated are different, the basic problems are common to most of them; they relate to the effects of ionizing radiation at the cellular and sub-cellular level. The different enquiries and findings are therefore complementary, and the effectiveness of the Agency's support depends not only on specific investigations but also on the co-ordination of experimental approaches.

Last month the Agency arranged a panel discussion by the holders of some 20 contracts for research into different aspects of radiation effects at the cellular and sub-cellular level. The scientists in charge of the research projects described the work they have undertaken, and there was an informal discussion on each topic. The discussions, which afforded an opportunity for a mutually useful exchange of information and views, were directed by some leading specialists in radiobiology who attended the meeting at the Agency's invitation.

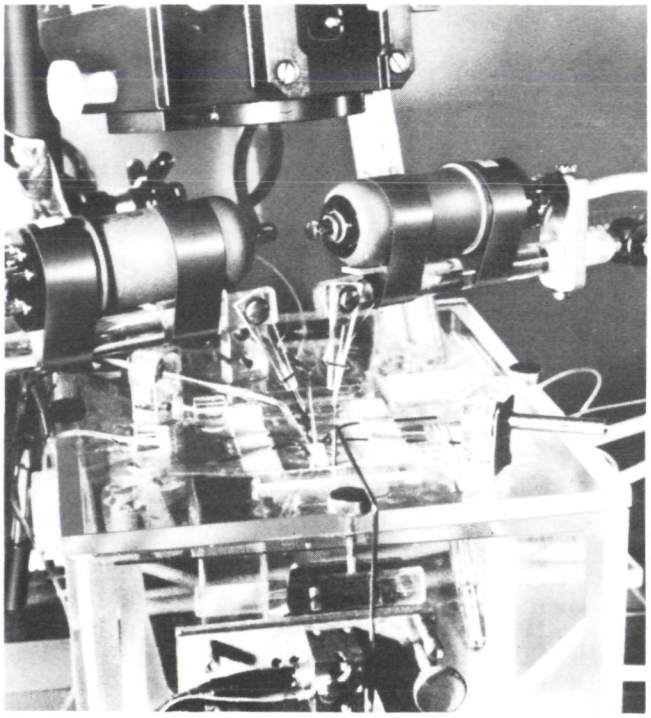
Aspects of Radiation Effects

The problems discussed were grouped under five broad subjects. The first was natural sensitivity or resistance to radiation in different biological systems. As is well known, the sensitivity to radiation often varies greatly from one organism to another; mammals, for example, are generally much more sensitive to radiation than micro-organisms, and again the micro-organisms themselves show remarkable variations in their sensitivity to radiation. It may, however, be possible to modify the natural resistance by chemical or biochemical means, and methods of such modification formed another subject of discussion at the panel meeting.

An important topic discussed at the meeting was the mechanism of radiation damage at the cellular and sub-cellular level. This is an extremely complex subject, about which a good deal is still unknown. While the symptoms of radiation injury have been studied in great detail, the exact course of the complete chain reaction by which the damage is caused is still not fully clear. But intensive research is continuing and progressively more information is being gathered. Some of the latest trends in research and their results as well as possible lines of further investigation were discussed at the meeting.

These investigations into fundamental radiobiology have a vital bearing on a number of practical problems as well. One such problem is chemical and biochemical protection against radiation, which is assuming progressively greater importance with the increasing uses of atomic energy all over the world. If the resistance of a biological system to the effects of ionizing radiation can be increased by chemical or biochemical means, it will be possible to ensure greater safety for people who may be accidentally exposed to high doses of radiation in the course of their occupational tasks. On the other hand, by increasing the sensitivity of radiation of certain micro-organisms, it may be possible to devise new and better methods for the preservation of food or sterilization of drugs. One difficulty in this work at present is that many of the micro-organisms require extremely high doses of radiation for their destruction, which makes sterilization a difficult and sometimes a potentially unsafe process. If they could be made more sensitive, a much lower and completely safe dose could be used for the large-scale sterilization of food and drugs. Both these practical possibilities were discussed at the meeting in Vienna last month in the light of the latest findings of radiobiological research.

Work on the use of radioactive chromium in the diagnosis of a type of anaemia, being conducted at the Radioisotope laboratory of the Republic Hospital in Baghdad, Iraq, under a research contract awarded by IAEA



Experimental set-up at the Vienna University Pharmacological Institute for research on the electrophysiological responses of biological systems to low-level irradiation

Variety of Projects

The importance attached by the Agency to the task of radiation safety and protection will be clear from the number and variety of research contracts awarded in this field. A few contracts have been given for research on health physics problems, including one placed in Sweden for a radioisotopic study of calcium metabolism in man and another in Switzerland for measurements of radium and radiostrontium accumulation in humans and a study of its biological effects. Contracts for studies on low-level and immediate radiation effects have been given to institutes in Austria, Netherlands, Poland, Switzerland and the United Kingdom. Five Agency-supported research projects - in Finland, Japan, Norway and Sweden - are concerned with the genetic consequences of radiation. Three contracts have been given for research on biological protection against radiation, including one placed in Czechoslovakia for the investigation of a method of counteracting incipient sterility resulting from accidental radiation exposure, while the protective action of certain chemical substances is being studied under some other contracts awarded by the Agency. Investigations into different aspects of radiation resistance or sensitivity are being made under Agency contracts placed in France, Italy, Poland and the United Kingdom.

A number of contracts have also been awarded for research on the safe disposal of radioactive wastes. For example, an oceanographic laboratory in Italy is investigating the uptake, accumulation and loss of radioactive material by marine bacteria. Problems of radioactive contamination are also being examined at scientific institutes in Japan, one of which is studying the uptake of radioactive wastes by lowland rice from contaminated soils. Under another contract, research is being undertaken at an institute in Norway on the influence of radioactive wastes on biological conditions in a river.

By the end of 1959, the Agency had awarded 47 research contracts to scientific institutes in 20 countries and to one international body. Countrywise, the contracts were distributed as follows: Argentina 1, Austria 6, Belgium 1, Czechoslovakia 1, Finland 1, France 6, Federal Republic of Germany 1, Greece 1, Iraq 1, Italy 3, Japan 7, Netherlands 1, Norway 3, Philippines 1, Poland 3, Sweden 2, Switzerland 2, United Kingdom 2, USA 1 and Yugoslavia 2. One contract was awarded to an international working group on oceanographic radioactivity. The total expenditure to be incurred by the Agency on these projects is about US $400 000.

Experts from 21 countries attended a meeting held by IAEA in Vienna last month to consider problems of liability for nuclear ship hazards. In the picture above, from right to left, Mr. Albert Lilar, Deputy Prime Minister of Belgium and President of the International Maritime Committee who presided over the meeting of the expert panel; Mr. Anatol Nikolaiev, Deputy Chief, Treaty Law Department, Ministry of Foreign Affairs, USSR; Mr. Sterling Cole, Director General, IAEA; and Mr. Clarence G. Morse, Administrator, Maritime Administration, Department of Commerce, USA