

MEDICAL ISOTOPE APPLICATIONS IN IRAQ

An account of IAEA's contribution to the progress of nuclear medicine in Iraq is contained in the report of a medical radioisotope expert who spent about a year in Iraq on an assignment under the Agency's programme of technical assistance. He is Mr. Ralph Adams, of the School of Medicine, Department of Radiology, Loma Linda University, Los Angeles, California, USA.

The principal aims of this assignment, which began in November 1960, were: (a) to assist in the medical applications of radioisotopes in diagnosis, therapy and research, and (b) to train and advise the staff of the Republic Hospital, Baghdad. Mr. Adams also had to perform a few additional services concerning radiation protection.

The Radioisotope Department of the Republic Hospital started functioning in 1957 under Dr. Ali Al-Hindawi. When Mr. Adams arrived in Baghdad he found that an appreciable amount of radioisotope work had already been established. This included the study of anaemia with radioactive chromium, various radioiodine tests for thyroid function and several applications of isotopes in therapy.

Diagnosis

In the study of haemolytic anaemia (a disease which may be either inherited or acquired), red cells labelled with chromium-51 are reinjected into the patient and blood samples are later assayed to measure the survival rate of the cells. External counting is also performed over the liver, spleen and heart to determine the site of red cell destruction. The Agency has supported this work by awarding a research contract to the Republic Hospital in Baghdad.

Before Mr. Adams' arrival, several routine tests for thyroid function were already in regular use and one of his important tasks was to introduce some refinements in the techniques employed. He also initiated a method of producing radioiodine trace doses in capsule form, which obviated the need for a technician to spend long hours daily in the "hot" laboratory to pipette individual tracer doses.

Towards the end of his assignment, Mr. Adams was able to institute the "Hamolsky" test, in which the uptake of radioiodine-labelled triiodothyronine (a thyroid hormone) by red cells *in vitro* serves as an index of thyroid function, the uptake being increased in hyperthyroids and depressed in hypothyroids. The test is not affected by iodine-containing drugs and does not require the administration of radioactive material to the patient.

The thyroid tests were greatly facilitated by an isotope scanner (which may be described as an instrument for "seeing into" the body) provided to Iraq by IAEA under its technical assistance programme. The scanner, which has a three-inch scintillation detector, has proved very satisfactory in demonstrating various types of thyroid pathology. With certain electronic components which he had taken with him to Iraq, Mr. Adams also constructed a background subtractor for use with the scanner; by reducing the contribution of background radiation this instrument enhances the contrast of scintigrams, i.e. the visual images of the organs scanned. As an aid to the interpretation of scintigrams, Mr. Adams instituted 24-hour thyroid uptake measurements on a routine basis on all patients scanned for thyroid investigations.

Therapy

Before Mr. Adams' arrival, the therapeutic applications of radioisotopes at the Republic Hospital included the use of radioiodine in the treatment of hyperthyroidism and thyroid carcinoma (a type of cancer), of radiophosphorus in the treatment of leukaemia, of radiogold seeds and colloidal radiogold in the treatment of cancer, and the use of radiostrontium-yttrium eye applicators. Since the "hot" laboratory did not have remote pipetting equipment, Mr. Adams eventually built a remote pipetter with some materials and components available locally. For the administration of colloidal radiogold he set up a gravity-fed dispensing system which would work with disposable polyethylene tubing sets.

The isotope scanner provided to Iraq by IAEA is seen here in operation at the Radioisotope Laboratory of the Republic Hospital, Baghdad. The detector is placed over the neck of a patient with enlarged thyroid to study the distribution of radioiodine within the organ



A young patient with an unusually large goitre was examined at the Republic Hospital, Baghdad. Isotopic investigations are useful in investigating such disorders



Mr. Adams was further called upon to assist in planning a radiotherapy centre. The proposed centre is expected to have, among other things, a cobalt teletherapy unit, a 4 MeV linear accelerator, conventional deep therapy units and diagnostic X-ray units.

Research

Mr. Adams also helped in developing isotope applications in investigating the nature and causes of several diseases which constitute major public health problems in Iraq. One of them is iron deficiency anaemia which, it has been suggested, may be due to the loss of iron through sweat and skin-peeling during the extremely hot summers in the country. Before Mr. Adams' arrival, an attempt had been made to measure iron losses by total body counting of radio-iron, but it had not been very successful because of the inadequacy of the instruments used for the purpose. A considerable improvement in performance was made through the use of a scintillation counter placed in sequence at four positions about the body to simulate whole body counting. When the isotope scanner was available, a further improvement was effected by using the detector of the scanner and some of the associated equipment.

Another subject of investigation is endemic goitre, of which there is a moderate incidence in

many areas of Iraq. There are indications to suggest the cause to be iodine deficiency, and Mr. Adams initiated a project to assay the iodine content of thyroid specimens obtained from accident victims. He is now completing this project in California.

Yet another important medical problem in Iraq is the prevalence of liver cysts, formed by the echinococcus parasite, also known as hydatid disease. Under the guidance of the IAEA expert, patients suspected of harbouring hydatid liver cysts have been studied with the scanner following the intravenous administration of trace amounts of colloidal radiogold, which is rapidly taken up by normal liver tissue. On the scintigram the cysts are shown by voids, by irregularity of liver contour, or by gross displacement of functioning liver tissue. In his report, Mr. Adams has noted that the successful performance of the scanner in demonstrating hydatid cysts has become an important guide in the diagnosis of this disease and in planning surgery. In his view, this project has so far been the most significant outcome of IAEA's contribution to the progress of nuclear medicine in Iraq.

Training

The IAEA expert also helped in training Iraqi medical scientists and technicians in the use of radioisotopes in medicine. On his arrival, he gave a series of lectures to some chemists and technicians of the Radioisotope Department of the Republic Hospital. The subjects included physics, radiation protection, instrumentation and radioisotope laboratory techniques. Subsequently, less formal on-the-job training was given during the normal course of his work. Mr. Adams also conducted a series of 40 lectures on radiological physics for some graduate medical students being trained in radiotherapy.

Radiation Protection

Apart from assisting in the development of nuclear medicine, Mr. Adams helped with certain radiation protection activities in Iraq. He made a survey of the diagnostic installations of the X-ray Institute in Baghdad and submitted a report containing his findings and recommendations. Further, at the request of the Iraqi Atomic Energy Commission, he supervised the operation of the air monitor installed at the Industrial Research Institute in Baghdad. Mr. Adams also served as a consultant to the Iraqi Committee on Radiological Protection.