

Human Health

Objective

To enhance the capabilities in Member States to address needs related to the prevention, diagnosis and treatment of health problems through the development and application of nuclear techniques.

Nuclear Medicine

Therapeutic applications of nuclear medicine were addressed in two CRPs, both of which showed the medical and financial advantages of the new techniques. In one CRP, single dose therapeutic radiopharmaceuticals were effective in haemophilic and rheumatoid arthritis patients. The other CRP, on liver cancer, focused on the safety and efficacy of a new therapeutic radiopharmaceutical and provided data from a multinational, multi-centre clinical trial involving 12 countries. Existing patient management strategies were reviewed as a result.

Under a technical cooperation regional project and national projects in Thailand and Philippines, a programme on neonatal screening for diagnosis of hypothyroidism was extended to cover rural areas. The progress of these projects has made it possible to increase the number of babies screened, resulting in more cases of hypothyroidism being detected and treated. More than 300 newborns were diagnosed with hypothyroidism in the last five years in Thailand. In this connection, preparation of a guidebook entitled *Newborn Screening for Congenital Hypothyroidism: Guidance for Developing Programmes* was completed.

An AFRA project, using in most cases expertise available in Africa, carried out management audits of nuclear medicine centres in Algeria, the Libyan Arab Jamahiriya, South Africa, Tunisia and the United Republic of Tanzania. These audits provided valuable information to managers of the centres to improve their clinical, safety and managerial services to patients, strengthen their nuclear medicine capabilities and enhance their contribution to national health care objectives.

Training programmes were strengthened through the revision of distance assisted course material for nuclear medicine technologists, and collaboration with the European Association of Nuclear Medicine for training fellows. In addition, a *Nuclear Medicine*

Resource Manual was prepared. The manual sets out the prerequisites for the establishment of a nuclear medicine service and for optimization of performance. It also contains sections on practical clinical protocols that are important for the accurate interpretation of results.

Radiotherapy and Radiation Biology¹

Upgrading the skills of medical practitioners in nuclear medicine and radiotherapy is a priority for many regions. Through two technical cooperation projects in Europe, more than 160 nuclear medicine physicians, radiation oncologists, medical physicists and radiotherapy technicians received training in 2005.

To further improve Agency activities in the field of cancer control, a cancer management meeting was organized for the first time in Vienna in which ministers of health, their deputies and leading medical professionals from 27 European Member States participated. Representatives from WHO and ESTRO were also present. The participants recognized the role of the Agency in the framework of cancer control programmes, in particular the contribution of nuclear technologies to treatment and palliation, and recommended future activities to further strengthen knowledge in cancer control.

A CRP investigating the possibilities of a shorter than conventional course of radiotherapy for cancers of the head and neck has shown that tumour control was improved markedly (by 32%). These results were featured as one of the 'Best of Oncology' presentations at the European Cancer Conference in Paris during October–November. The Agency's distance learning course in oncology, which has the objective of promoting radiotherapy expertise in developing countries, comprises modules in additional topics that trainee radiation oncologists should be taught, for example aspects of radiobiology, pharmacology and medical physics which may not be readily available from teachers in developing countries. These materials

¹ The Agency's Programme of Action for Cancer Therapy (PACT) is discussed in the chapter 'The Year in Review' at the beginning of this document.



FIG. 1. Treatment of a cancer patient using a cobalt teletherapy machine.

will substantially reduce the costs incurred by the Agency and Member States in training physicians specializing in radiotherapy.

In a WHO report on cancer control, the Agency contributed information on the planning and practical implementation of radiotherapy services in low to middle income countries (Fig. 1). The Agency, WHO and other partners will encourage countries to integrate cancer treatment into their national health agenda and facilitate the dissemination of the WHO report.

Technical cooperation activities in 2005 in the field of cancer management focused on supporting AFRA countries in enhancing their response to the increasing incidence of cancer, particularly HIV related cancers, through the provision of training to key personnel involved in cancer management. In addition, financial and administrative support was provided for the organization of the Third African Radiation Oncology Group Congress, which was held in South Africa in November 2005. The congress attracted more than 100 participants from Africa and other regions and allowed radiation oncologists and medical physicists to discuss treatment techniques and the region's strategy to combat cancer.

The Agency participated in a joint working group with the International Commission on Radiation Units and Measurements on the use of ions in applications of advanced radiation technologies in cancer treatment. Research on the biological effectiveness of ion beams as compared with conventional photon based radiotherapy focuses on the selection and definition of the involved quantities and units. The recommendations will help standardize dose reporting procedures in those centres using this particular type of radiation.

Dosimetry and Medical Physics

The Agency launched a new programme to build capacity in dosimetry through the creation of guidelines and teaching material to sustain the safe and effective use of ionizing radiation in medicine. In particular, a handbook entitled *Radiation Oncology Physics* was published as the first in a series of educational materials for teachers and students that defines an international curriculum for the academic training of medical physicists. Two countries in Africa have modelled their national curriculum on the handbook and centres in North America and Scandinavia are using it as resource material for their students. Clinical training in medical physics is being defined and developed through regional and national technical cooperation projects in Latin America, Europe, Africa and Asia. The training material developed by the Agency will be disseminated through a collaborative partnership set up during the World Conference on Physics and Sustainable Development, held in November in South Africa.

A new service, Quality Assurance Team for Radiation Oncology (QUATRO), was established by the Agency to assist cancer therapy centres in assessing and testing their readiness to adopt new technology. This was well received, resulting in four QUATRO missions during the year. By repeating a QUATRO mission after the implementation of new technology, it should be possible to gather information demonstrating the impact of the technology and thus to contribute to measuring results based performance indicators. In some cases, the outcome of a QUATRO audit may also identify the participating radiotherapy department as a 'Centre of Competence', enabling it to serve as a model and future reference centre for training professionals from other institutes in the country.

Proper application of radiotherapy procedures on a patient requires regular control of dosimetry and mechanical parameters of radiotherapy machines. This is achieved by implementing quality assurance and quality control (QA/QC) programmes. Under a technical cooperation project, Thailand received assistance in performing calibrations for cobalt-60 teletherapy and linear accelerator machines. In Yemen, Agency assistance resulted in the establishment of the first radiation oncology centre in Sana'a — as of March 2005, the centre was treating an average of 100 patients per day. In Jordan, the Al Bashir Hospital in Amman acquired single photon emission computed tomography capability for

increased accuracy and diversification of clinical investigations of patients. In Mongolia, the facilities and human resources in nuclear medicine and radiotherapy have been improved, resulting in a strengthening of routine services to patients and a tripling in the number of patients benefitting from these services compared with those treated in 1997.

Construction work to expand the Agency's Dosimetry Laboratory was initiated and neared completion in 2005. The expanded facilities will meet the increasing demands of Member States for dosimetry calibration and measurement services.

Nutritional and Health Related Environmental Studies

The prevalence of micronutrient deficiencies — also called “hidden hunger” — is very high in many developing countries, in particular in vulnerable population groups such as infants, young children and women of child bearing age. A CRP, aimed at contributing to the development and evaluation of different strategies to combat micronutrient deficiencies, neared completion in 2005. This CRP, the first of its kind, supports post-graduate students in developing countries.

Combating HIV/AIDS

Of the more than 40 million people living with HIV/AIDS worldwide, nearly 30 million are living in sub-Saharan Africa. The situation is exacerbated by limited health care, food shortages and the high prevalence of undernutrition. An integrated approach, including strategies for prevention of transmission of the virus as well as the treatment and care of HIV infected individuals is urgently needed. During 2005, the Agency — together with WHO and UNAIDS — supported two regional projects in Africa, one on nutrition and the other in support of the UNAIDS–WHO African AIDS Vaccine Programme, and implemented three CRPs in nutrition, cancer treatment and the diagnosis of opportunistic infections. Research focused on the advantages of using nuclear techniques in improving nutrition, health and the well being of HIV infected individuals in developing regions.

Nutrition and HIV/AIDS

The importance of an adequate diet, and integrating nutrition into a comprehensive

response to HIV/AIDS, were highlighted by WHO. In particular, as antiretroviral (ARV) treatment becomes readily available in poorer areas, the associations between nutrition, HIV/AIDS and ARV treatments need special attention. There is an urgent need to evaluate the effect of locally appropriate and sustainable food-based strategies on nutritional status and the potential impact of nutritional supplementation on delaying the initiation of ARV treatment and/or on the response to ARV treatment. In conjunction with a regional technical cooperation project in Africa, a new CRP on nutrition and HIV/AIDS will evaluate the efficacy of nutrition interventions in people living with HIV/AIDS, based on changes in body composition (muscle mass) measured by stable isotope techniques.

Cancer treatment and AIDS patients

Certain types of cancer often develop in HIV infected individuals, for example cervix cancer. However, information is limited about the optimal treatment of this particular patient group, particularly in developing countries. Preliminary data indicate that HIV infected women with cervix cancer may respond differently to radiotherapy than non-infected women. Well established, standardized treatment protocols might therefore need to be modified to maximize benefits and minimize risks related to the treatment. The potential benefit of a modified treatment schedule is currently being evaluated in a CRP in several African countries and in India. As part of this project, a combination of external beam radiation therapy with high dose or low dose rate brachytherapy will be evaluated, together with the potential benefits of chemotherapy. Laboratory experiments in China will provide an insight into the mechanism of how HIV infection influences the response to radiotherapy so as to better understand the outcome of this clinical study.

AIDS vaccine

An effective vaccine against HIV offers the best long term approach to control the HIV/AIDS pandemic. Unfortunately, the development of an effective vaccine is complicated by the large differences between strains, in particular in Africa. An Agency regional project in Africa is supporting the UNAIDS–WHO African AIDS Vaccine Programme. It is contributing to the establishment of a network of African laboratories in countries where clinical trials are ongoing in order to test newly developed vaccines against HIV. Nuclear techniques in molecular epidemiology and immunology will be

introduced into these laboratories to support vaccine programmes and to monitor mutation of HIV to predict drug resistance in order to optimize the treatment and care of HIV infected individuals.

Opportunistic infections

HIV infected individuals tend to be more prone to opportunistic infections because of the loss of a normal functioning immune system. Such infections cause significant suffering in HIV infected patients, and so rapid diagnosis and adequate treatment are essential to reduce morbidity and mortality. Unfortunately, many opportunistic infections remain untreated in developing countries or are treated improperly with broad spectrum antibiotics or

antifungals, resulting in increased drug resistance. The Agency initiated a CRP to explore the diagnostic advantages in locating and characterizing the extent of opportunistic infections by techniques used in nuclear medicine. These techniques can be used to determine the effectiveness of treatment and the extent of underlying or residual infections. One of the major aims of this project is to empower nuclear medicine facilities in developing countries by making available locally radiolabelled Immunoglobulin G (IgG) for infection imaging. Results to date indicate the feasibility and sustainability of labelled IgG, suitable for use in patients, and it has been produced in countries in Asia and Latin America. ■