

THE ROLE OF THE INTERNATIONAL ATOMIC ENERGY IN PROMOTING NUCLEAR MEDICINE IN DEVELOPING COUNTRIES

M. Nofal

International Atomic Energy Agency Vienna, Austria

Introduction

When the International Atomic Energy Agency was established as an autonomous member of the United Nations family in 1957, a prominent assignment was to "seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world." The inclusion of "health" reflected the fact that medical uses of radiation and radionuclides were among the first and most widespread applications of "atomic energy." Although the World Health Organization has been given responsibility for the United Nations' main efforts in health, the close association of radionuclides with atomic energy was believed to justify a continuing role for the new Agency in their use in medicine and biology.

Because of their diversities, medical and biological uses of radiation and radionuclides are performed in more countries and in more laboratories than any other application of atomic energy. This diversity establishes the character of the Agency's programme: instead of a few large projects, many small activities are supported, tailored to the needs and wishes of individual countries. Furthermore, the Agency's efforts are directed particularly to developing countries.

Mechanisms

1. Research programme

It provides sponsorship of integrated research at a substantial number of institutions and in a considerable range of activities. The programme thus came to be heavily oriented, at an early stage, towards areas of relevance to developing countries, either by developing a new application or, more commonly, by adopting available techniques to local problems.

The limited funds available for support of research, combined with the international character of the Agency, provide strong impetus for the development of research programmes in which groups of institutes work on well-defined themes usually chosen for their relevance to the needs of developing countries. In order to ensure proper coordination, meetings of chief scientific investigators of the institutes are arranged at appropriate intervals. The time-span for most of these programmes is set at about 5 years. The role of the Agency in supporting research thus became not just a catalytic one but also a coordinating one.

The use of research agreements was introduced, designed to provide for the participation of selected institutes, mostly from developed countries, in coordinated research programmes without reimbursement. However, provision is made in each case for inviting the chief scientific investigator to any coordination meeting held.

Over \$700,000 per year are distributed in the programme of Human Health, and over 100 laboratories are receiving support at any one time.

2. Technical cooperation

Various mechanisms have been involved at different times for assisting Member States in the Agency's fields of activity. Most of the proposed activities are intended to benefit developing countries in particular, and it was expected that many divisions of the Agency would be heavily involved in these activities which, in the biomedical field, currently account for about 8% of the Agency's regular programme for technical cooperation. During the last 10 years, funds for the Agency's programme on technical cooperation – in general – have been more than tripled, amounting now to over \$30 million.

The Agency's fellowship programme provides opportunities for young scientists mostly from developing countries to undergo specialized training or do research in more advanced institutes, after nomination by their governments. The Agency's records show that many of the early fellows have been serving in leading positions in their countries for some time.

In addition, the Agency sponsors training courses and study tours: seven this year in the area of medicine and biology, for groups of about 30 candidates; four of these courses will be in nuclear medicine.

The Agency also sends experts in particular fields to institutions and laboratories in developing countries for periods of a week to a year, or more. They install or introduce equipment and train local staff so that the activities continue after they depart.

Moreover, the Agency provides specialized radiation measurement equipment or related apparatus to particular laboratories often in conjunction with the work of the experts.

It is important to note that all technical cooperation projects are channelled through governments; governments submit requests and are responsible for the effective use of resources provided.

3. Information exchange

One prominent mechanism of information exchange is through meetings of various formats and publications of various types. Every year, the Agency organizes one or two symposia at which specialists from developed and developing countries review progress and present their latest findings on a specific subject. In addition, it convenes several smaller meetings of experts (advisory groups and consultants) to examine particular topics in depth, to plan future programmes or to review results achieved in research activities. An important component of the Agency's work is the provision of information via technical reports of various kinds, the proceedings or results from these meetings also being published by the Agency. All publications are publicly available, some free, some at cost.

Nuclear Medicine Programme

The objectives of the Agency's programme are generally to apply nuclear medicine techniques effectively in developing countries to the diagnosis and management of patients attending nuclear medicine units in about 60 countries. Also, the programme is directed towards the use of these techniques in the investigations related to control of disease distinctive to some of these countries, i.e. parasitic diseases.

The broad aim is to improve health standards through better diagnosis, and achieving a better understanding of disease processes and their prevention and management.

A consultants' meeting held by the Agency in 1982 advised on the need of a coordinated research programme on assessing the efficiency of optimization of nuclear medicine procedures for diagnosis and management of thyroid disorders by the proper selection of both in-vitro and in-vivo tests. This has been implemented and a group of laboratories are now participating in the project.

Patients with liver diseases constitute, in many countries, one of the largest groups referred for in-vivo radionuclide investigations, mostly imaging. Last year a meeting was held in Seoul with the distinguished specialists from 12 Asian countries to formulate a research and training programme on quantitative evaluation of nuclear medicine procedures in the diagnosis of liver diseases. The programme has started with the participation of leading nuclear medicine laboratories in the area and will include liver phantoms as well as patient images.

Another area in the Agency's activities in nuclear medicine is the quality control of radioimmunoassay procedures of thyroid-related hormones. Reference serum samples are distributed to different laboratories for measuring these hormones and to help assessing accuracy, reliability and consistency of results obtained with these techniques.

Another related activity is the application of data processing programmes for internal quality control of radioimmunoassay for use with inexpensive programmable calculators. The objective is to reveal the quality of the analytical results and to stimulate its improvement through this feedback, without the need for sophisticated computers.

The Agency's component on the control of parasitic infections of man and of disease vector by means of nuclear techniques is designed to encourage research into development of new techniques, the evaluation of existing methods, and the development of expertise in such techniques in institutes in the developing world.

The component of nuclear techniques for the detection of parasite antigens is designed to evaluate immunoradiometric assays using monoclonal antibodies for detection of circulating parasite antigens in patients with filariasis, schistosomiasis and malaria.

The Agency is also concerned with the development of nuclear techniques for monitoring of malaria vectors. This is basically concerned with the evaluation of an immunoradiometric assay for detection of malaria sporozites in mosquitoes, which provides an easy and more rapid alternative to conventional dissection of mosquitoes in order to determine the transmission rate of the disease.

A related area of research in the field of parasitology is the development of a vaccine against

schistosomiasis based on antigens present in irradiated larvae.

An aspect which is closely tied with the development of nuclear medicine but often neglected is the question of instrumentation. The type of instruments suitable for nuclear medicine applications in developing countries may be rather different from that applied in industrialized countries. Quality control of these devices is absolutely essential to assure the clinical test results are free of artifacts caused by faulty performance. Problems in instrumentation can lead to incorrect clinical interpretation resulting in misdiagnosis of the disease.

A coordinated research programme has been organized to establish national projects to investigate the performance and reliability of quality control of in-vivo procedures of nuclear medicine instruments in Asia and Latin America. Each participating country designates a local counterpart to visit nuclear medicine laboratories and set up and correct quality control procedures including the use of Agency/WHO designed phantoms.

Maintenance of nuclear instruments in developing countries presents numerous difficulties, with many factors contributing, such as environmental conditions, lack of proper servicing, lack of trained local technical staff, shortage of spare parts, in addition to the administrative and financial problems. To guarantee reliable results of the clinical investigations carried out, as well as the effective use of the invested capital, the Agency has established a programme which deals with the implementation of maintenance plans including preventive maintenance, power and air conditioning and related problems. This activity has been implemented in 45 laboratories in Asia and Latin America through research projects as well as training courses and workshops. Some of these courses are designed to train the trainers who later can conduct their national workshops.

In August this year the Agency will hold an International Symposium on Nuclear Medicine in Developing Countries, at its Headquarters in Vienna. I do hope that many of you, from all over the world will be able to participate.