CYCLOTRON FACILITY FOR MEDICAL RADIOISOTOPES (SYR/4/007) G5 New

MODEL PROJECT

CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US $	US $	US $	m/d	US $	m/d	US $	US $	US $	US $	US $
1997	3/28	51,920	0	200,000	12/0	37,800	0/14	4,480	0	0	0	294,200
1998	3/0	41,850	0	210,000	12/0	39,600	0/0	0	0	0	0	291,450
1999	2/0	29,400	0	225,000	12/0	41,400	0/0	0	0	0	0	295,800
2000	2/0	30,900	0	175,000	6/0	21,600	0/0	0	0	0	0	227,500

First Year Approved: 1997

OBJECTIVES: This project addresses the major development objective of improving and expanding the availability of health care in areas of high national importance while reducing overall diagnosis and management costs per patient. The project's specific aims are to assist in the establishment of a cyclotron facility for the production of short-lived radiopharmaceuticals, and to promote their full utilization in medical practice.

BACKGROUND: Syria's main nuclear medicine centre in Damascus dates from 1972. Currently over 100,000 patients receive treatment there each year. Of these, 5000 receive nuclear medical treatment and 38,000 undergo radiation therapy. Even so, the capacity is insufficient to meet all needs. Endocrinological disorders and thyroid-related diseases are prevalent in Syria. The incidence of cardiovascular disease is as high as in Europe, Japan, and North America, contributing about 30% to total mortality. In modern medical practice, nuclear medicine procedures are the diagnostic methods of choice in both endocrinology and cardiology, as well as in other fields. This is true not only because of their scientific superiority. Study after study throughout the world indicates they

are also more cost-effective. The Government has ambitious plans to expand nuclear medicine capabilities throughout the country over the next five years. For example, the Ministry of Health is planning to open a new centre for heart disease diagnosis and treatment every six months between now and year 2000. They will all feature modern radiographic imaging devices. The Government also plans to open four new centres for cancer diagnosis and treatment at which nuclear medicine will play a major role. Both types of facilities will employ both positron emission tomography (PET) and single-photon emission computed tomography (SPECT) using short-lived radiolabelled imaging agents. The availability of locally produced radiopharmaceuticals and diagnostic reagents is crucial to all these plans. The conventional radiopharmaceuticals used during nuclear medicine examinations have reached the limits of their potential and cannot provide further improvements in diagnostic efficiency or health care cost reductions. Furthermore, despite significant advances in the past two decades in morphological imaging, pathological changes often become apparent only after the disease has reached a fairly advanced stage. On the other hand, pathophysiological alterations in organ function or metabolism usually occur and can be detected long before there is visual evidence of structural change. The introduction of PET actively stimulated the development of more effective radiopharmaceuticals and created the possibility of using labelled metabolites and many other carrier molecules which otherwise could not have been labelled. These advances clearly demonstrate the potential of nuclear medicine to monitor subtle changes in metabolism and thus detect the earliest stages of many serious diseases. Owing to its high diagnostic accuracy, nuclear medicine has a positive impact on recovery rates, as well as on health care costs. Results from the clinical application of positron-emitting radiopharmaceuticals in more than 100 PET centres all over the world demonstrate very clearly that positron emitters are a new tool in diagnostics which can substantially increase both the quality and effectiveness of health care.

PROJECT PLAN: The project activities extend over four years in several, sometimes overlapping, phases. The major activities and their time frames are (i) cyclotron order and facility design (96-97); (ii) building construction and acceptance (97-99); (iii) hot cell equipment order and installation (97-99); (iv) cyclotron installation (98-99); (v) PET and SPECT camera installation (99-00); (vi) Xe-I target and F-18 FDG module installation (99); and production of F-18 FDG, I-123, and Tl-201 (from late 1999). A phased training plan matching these hardware targets is in place. The priority for production of radioisotopes for in vivo imaging will be F-18 FDG for oncology and heart studies; followed by (ii) I-123 for thyroid imaging, renal studies, and monoclonal antibodies for tumor imaging; (iii) Tl-201 for heart disease; (iv) Ga-67 for detection of lesions and tumors; (v) In-111 for neuro-endocrine tumors; and (vi) C-11 for probing biochemical pathways. Certification of quality control and assurance procedures will precede release of materials to medical practitioners. A highly detailed workplan is available covering the entire four years of project activity, including projected costs of all major capital items. Radiation safety and radiological protection services are well established. The Atomic Energy Commission of Syria will be responsible for implementation of the plan.

NATIONAL COMMITMENT: The Government commissioned five new SPECT cameras in 1996 and plans the addition of 13 more in the next five years. It plans major investments in regional facilities for nuclear medicine diagnosis and treatment. Investment in the cyclotron and associated facilities alone will run to about $6 M at current prices. The cyclotron and associated radiochemical facilities will be the centrepiece of a National Radiation Medical Centre. The Prime Minister of Syria issued a letter of commitment dated 23 July, 1995, guaranteeing funding and designating the AECS as the executing body. With this authorization, the AECS began scheduling the project and reserving the necessary funds to defray all operating and staff costs. Nine of the 20 specialists to be assigned to the project have already been recruited.

AGENCY INPUT: The Agency will provide support in the form of major equipment, such as hot cells, Xe-I targets, automated radiolabelled synthesis units, dosimetry and radiation safety and monitoring instruments; training and fellowships; and expertise and expert services. The Agency has already assisted by providing experts under SYR/8/006/02, -03, and -04 who advised on cyclotron specifications, undertook feasibility studies, and assisted with formulation of the project proposal. The selection of F-18 and I-123 as the initial targets for production runs grew out of an IAEA Consultants Meeting held 13 - 16 November, 1995, in Vienna. The Agency's future involvement will include regular interactions through at least one expert on a continuing basis, with the consultation of other experts as the need arises. The detailed project plan enumerates those areas where Agency assistance will be particularly important.

PROJECT IMPACT: The project will have direct impact on health care in Syria and possibly in neighboring countries. Local production of radioisotopes will eliminate problems associated with their importation, and create new applications especially for very short-lived isotopes. Cost-containment is also an important consideration. Here, too, the expected impact of the project is considerable. Therapeutic and diagnostic procedures must be cost-effective and provide data that aid in the selection of optimum management strategies. If effectiveness is defined as cost per year of quality life added, nuclear medicine emerges as the clear choice for diagnosing and treating many diseases. For example, treatable malignancies with good prognosis for cure and long disease-free survival should receive priority over non-treatable conditions where intervention is unlikely to affect the course of the disease or the patient's quality of life. Modern nuclear medicine techniques put such distinctions on a more objective basis and thus lead to a better allocation of scarce resources.