THE IAEA ACTIVITIES ON SUPPORTING THE USE OF UNSEALED RADIOISOTOPES FOR THE TREATMENT OF MALIGNANT AND BENIGN DISEASES

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The Nuclear Medicine Section of the IAEA has a long tradition in supporting the implementation of effective therapeutic application for the management of cancer and benign conditions. This obligation resides in Article II of the IAEA Statutes[1] (1). The specific mission is to foster the application of nuclear medicine techniques in those diseases that may successfully be managed using radioisotopic applications. In addition to documents related to therapeutic application of unsealed radioisotopes (2, 3), the IAEA was successful in managing a multicentre Coordinated Research Projects (CRPs) for the treatment of Hepato Cellular Carcinoma published recently in a special edition of the Seminars (4). Other CRPSs were aimed at improving quality of life of patients suffering from rheumatoid arthritis and haemophilic arthropathy (5, 6) and the palliation of disseminated metastatic bone pain[2]. In addition, to disseminate knowledge, high level experts are invited to consultancy panels to assist in producing relevant documents in the field of Nuclear Medicine, including publications, manuals and educational material all of which are accessible on-line[3]. The Department of Nuclear Sciences and Application (NA) has identified the need to enhance the availability and accessibility of Member States to medical radioisotopes potentially attractive for clinical use, one of these being Lutetium-177. To achieve this objective a world-wide network of cooperation was established. Since several countries operating nuclear reactors at a low to medium-neutron flux are capable of producing sufficient amounts of Lu-177 for the labelling of bone seeking radiopharmaceuticals, Lu-177 ethylenediamine tetra(methylene phosphonic acid) (^{177}Lu-EDTMP) has been identified for its clinical potential as a safe, sustainable and cost-effective radiopharmaceutical for the management of bone pain caused by metastatic prostate and breast cancer.

To fulfil the highest standards of international legal requirements, animal studies (7) and pre-phase-I (micro dosing study) provided needed pre-clinical information on the bio-distribution of the particular ^{177}Lu-EDTMP formulation that has been produced under GMP conditions by Polatom®, Poland.

This data was used to design a phase I/II clinical trial on the biological safety and efficacy of ^{177}Lu-EDTMP as a bone pain palliating radiopharmaceutical.

To better assess toxicity results during the clinical phase-I investigation, a novel approach was introduced to predict patients' individual bone marrow absorbed dose. In close collaboration with another NA Section, namely "Dosimetry and Medical Radiation Physics" (DMRP), a consultancy of worldwide leading medical physicists was called to discuss and finalize a user-

[1] http://www.iaea.org/About/statute.html

[2] http://www-naweb.iaea.org/nahu/nm/crp.asp

[3] http://www-pub.iaea.org/MTCD/publications/publications.asp

friendly programme to predict the bone marrow absorbed dose by means of a micro-dosing of the therapeutic radiopharmaceutical followed by 24 hours whole body scintigraphic imaging. Preliminary results based on urine analysis and whole body imaging up to 7 days post injection indicate a bio-distribution similar to that of Samarium-153 EDTMP.

With regard to short and medium term projects on therapy with unsealed radioisotopes, joint effort among leading institutions world-wide with the support of *Department of Nuclear Sciences and Applications* is aiming at enhancing Member States' self-reliance in utilising a selection of novel radiopharmaceuticals, proven clinically effective and safe, to manage chemotherapy-resistant tumours. Ga-68 radiopharmaceuticlas as a powerful diagnostic tool for Positron Emission Tomography (PET) has been identified as an important application for the management of NET and a variety of Somatostatin receptor (SSR) expressing tumours. In conjunction with high specific-activity Lu-177 loaded to targeting peptides, e.g. SSR analogues or monoclonal antibodies a synergy is created to provide patient-specific, individually designed treatment approaches.

The IAEA acknowledges professionals from all associated fields for their invaluable contributions to promoting therapeutic applications of Nuclear Medicine. As a team they are indispensible strategic partners in making available isotopes and radiopharmaceuticals, insight of dosimetry and foremost to those at the forefront, daily engaged in treating patients and alleviating their pain.

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