RADIOPHARMACEUTICALS FOR COST EFFECTIVE MANAGEMENT OF CANCER

IAEA Deputy Director General and Head of the Department of Nuclear Sciences and Applications, Aldo Malavasi (left), and João Alberto Osso Junior, Head of the Radioisotope Products and Radiation Technology Section of the IAEA Division of Physical and Chemical Sciences (right), at the third Research Coordination Meeting on the Development of Gallium-68 based PET-Radiopharmaceuticals for Management of Cancer and Other Chronic Diseases.

(Photo: C. Gravino/AEA)

The search for swift and precise scientific procedures that can map the human body for exact diagnosis and rapid treatment for diseases like cancer has long been on the global agenda. Among the medical techniques developed is the unique application of nuclear technology using radiopharmaceuticals.

Radiopharmaceuticals are radiotracers used in small amounts for imaging organ functions and diagnosing diseases. The radiation a patient receives from them is very low, non-invasive and considered safe. Its emissions can be precisely detected, producing images useful for diagnostic purposes.

Imaging techniques, such as computed tomography (CT), magnetic resonance imaging (MRI) and ultrasonography, are capable of charting physiological function and metabolic activity. Radiopharmaceuticals, in comparison, can provide more specific and detailed information about organ function and metabolism.

Radiopharmaceuticals are commonly used with a well-established scanning device, such as positron emission tomography (PET). The conventional PET radiopharmaceuticals are mainly based on the radioisotope fluorine-18. However, the production of fluorine-18 requires a cyclotron[1] and associated facilities, which are quite expensive and time-consuming to set up. In contrast, another suitable radioisotope, gallium-68, is readily available through germanium-68/gallium-68 generators.

The gallium-68 radioisotope has favourable physical properties and is significantly cheaper than cyclotron-produced radioisotopes.

[1]A cyclotron is a complex machine that accelerates charged particles in a vacuum outwards from the centre along a spiral path. During the acceleration process, charged particles gain significant energy. The energized charged particles then interact with stable material that is placed in their path. The interaction transforms stable materials into medically useful radioisotopes that are used to make radiopharmaceuticals.

The IAEA is among the leading pioneers supporting the development of state-of-the-art nuclear technology in the use of radiopharmaceuticals. It hosted a Research Coordination Meeting at its headquarters from 1 to 5 September 2014 as part of an ongoing IAEA coordinated research project focusing on the development of gallium-68 radiopharmaceuticals. The meeting involved 17 institutions from across the world that are working to develop gallium-68 radiopharmaceuticals.

At this meeting, results from various countries were analysed and the work plan for the next period of the project was discussed. It was agreed to produce and test ready-to-use 'kit' chemical formulations with the gallium-68 radioisotope obtained from a germanium-68/gallium-68 generator.

In his welcome address, IAEA Deputy Director General and Head of the Department of Nuclear Sciences and Applications, Aldo Malavasi, highlighted the importance of gallium-68 radiopharmaceuticals as a diagnostic tool in nuclear medicine, and pointed out the relevance of the work performed by researchers in this field.

In particular, producing kits ready to be labelled with the radioisotope would facilitate its use in clinics, said Mr. Malavasi, and would further enhance the usefulness of this nuclear technique in enabling better management of cancer and other diseases.

There are some types of cancer, such as neuroendocrine cancers, that are best diagnosed and monitored through gallium-68 radiopharmaceutical imaging. As no cyclotron is needed nearby, the establishment of PET/CT facilities using gallium-68 radiopharmaceuticals could be a sustainable starting point for middle and lower income countries to embark on medical imaging of such types of cancer, as well as other infectious diseases.

Aabha Dixit, IAEA Office of Public Information and Communication in collaboration with the Radioisotope Products and Radiation Technology Section, IAEA Department of Nuclear Sciences and Applications