CERN and the JRC to scale up production of alpha-emitters against cancer

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A novel, accelerator-driven method could produce nuclides for targeted alpha therapy of cancer in practically unlimited amounts, overcoming current obstacles for its wider use due to a limited production of alpha-emitters. The JRC and the Conseil Européen pour la Recherche Nucléaire (CERN) have embarked to explore the potential of the jointly proposed method.

The method for production of 225Actinium and its daughter nuclide 213Bismuth, the two most promising radionuclides for application in targeted alpha therapy, is based on the irradiation of natural 232Thorium with high energetic protons (200-800 Mega electronvolts). CERN is one of the few facilities world-wide capable of producing protons of such high energy. In addition, the combination with CERN's mass separating system ISOLDE provides a unique capability of removing undesirable contaminants such as 227Actinium from the product. ISOLDE stands for Isotope Separator On Line Device.

Consequently, the combination of JRC's long-lasting experience in targeted alpha therapy research and CERN's exceptional facilities provides a world-wide unique opportunity to advance the production of 225Ac and 213Bi for the benefit of cancer patients in Europe and world-wide.

The JRC has participated in studies on their use in cancer treatment since 1997, first in clinical studies on leukemia, and later on Non-hodgkins lymphoma, brain tumors, bladder carcinoma, malignant melanoma, neuroendocrine tumors and prostate cancer. The research has demonstrated the therapeutic efficacy and safety of using 225Ac and 213Bi.

The JRC's Institute for Transuranium Elements (ITU) is one of the only three institutions worldwide capable of producing the valuable alpha emitters in levels that are clinically relevant. The other two are Oak Ridge National Laboratory, the largest US Department of Energy science and energy laboratory and Russia's Institute for Physics and Power Engineering (IPPE).

To date the further development and widespread commercial application of TAT has been hampered by the limited supply of 225Ac and 213Bi. The currently used process cannot be scaled up easily as it relies on the extraction of Thorium-229 from nuclear weapons material (Uranium-233), which is hardly accessible. Hence the JRC-CERN collaboration opens the door to alternative solutions.

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