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The ISOLPHARM project at LNL: Production method of high specific activity radionuclides as radiopharmaceutical precursors

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At INFN-LNL (Istituto Nazionale di Fisica Nucleare –Laboratori Nazionali di Legnaro) a new facility for the production of radioactive ion beams is implemented, SPES (Selective Production of Exotic Species). This new facility, besides being operated for nuclear physics studies, may play a pivotal role in the production of medically relevant radionuclides by means of the ISOL (Isotope Separation On-Line) technique.
The production of the radioactive isotopes will be obtained by nuclear reactions induced by 40 MeV protons, accelerated by a cyclotron, that will collide on a target composed of 7 discs of carbon dispersed uranium carbide (UCx), properly spaced in order to dissipate the heat (8 kW) generated by the reaction. The uranium contained in the target material will be 238U, so that the produced radioactive isotopes will belong to elements having an atomic number between 28 and 57 (elements placed between nickel and lanthanum). In particular, most of the produced nuclides will be neutron-rich, so with an excess of neutrons with respect to the element stable nuclear configuration.
The core of the method is the possibility to obtain pure isobaric beams following mass separation; in this way no isotopic contaminations will be present in the beam and afterwards in the trapping substrate. Only potential isobaric contaminations can affect radiochemical and radionuclide purity, but proper methods can be developed to separate chemically different elements
The goal of the ISOLPHARM project is to provide a feasibility study for an innovative technology for the production of extremely very high specific activity beta emitting radionuclides as radiopharmaceutical precursors. This revolutionary technique will allow to obtain radiopharmaceuticals, impossible in most cases to obtain in the standard production facilities (neutron reactors or cyclotrons), with lower costs with respect to traditional techniques and reduced environmental impact.
The steps to be addressed for the preparation of the radiopharmaceutical are: 1) Trapping of the radionuclide of interest present in the beam by means of the construction and placement of a suitable substrate; 2) Preparation of a medicinal product compatible with the method of administration; 3) Agreement with the requirements of quality guaranteed by compliance with the principles of Good Manufacturing Practice (GMP) in the field of radiopharmaceuticals. The ongoing activities concerning a recent experiment focused on 111Ag, a study performed in collaboration of Padova and Trento Universities, will be presented.

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