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Radionuclide production and separation towards medical application at Paul Scherrer Institut

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The Paul Scherrer Institute (PSI) is the largest research institute for natural and engineering sciences in Switzerland, focusing on cutting-edge research in four fields, namely, Future Technologies, Energy and Climate, Health Innovation and Fundamentals of Nature. PSI develops, builds and operates complex large research facilities, in particular, one of the most powerful proton accelerators worldwide.
An important component of innovative radiopharmaceuticals, especially in oncology, is the availability of various radionuclides with optimal decay properties for the improvement of diagnostic or therapeutic efficacy. The Laboratory of Radiochemistry (LRC) at PSI, in collaboration with the Center of Radiopharmaceutical Sciences (CRS), produces and further develops a variety of accelerator, reactor (or Spallation Neutron Source) and spallation-induced radionuclides via its vast networks. Medical radionuclides must be available with high-specific activity and purity. Here, the choice of nuclear reaction and subsequent radiochemical isolation strategy play a key role.
To support the Swiss research community, PSI develops, builds and operates complex large research facilities (Fig. 1). The site hosts facilities such as the Swiss Light Source (SLS), the Swiss X-ray Free-Electron Laser (SwissFEL), the High Intensity Proton Accelerator (HIPA) facility - which also feeds the spallation neutron source (Swiss Neutron Source, or SINQ), the muon source (SμS) and the Swiss Research Infrastructure for Particle physics (CHRISP). More than 2500 scientists from all over the world use these large facilities for research and development.
A novel irradiation station with high-energy protons at PSI, in the view of enlarging the radionuclide production portfolio in Switzerland as well as Europe, referred to as TATTOOS (Targeted Alpha Tumor Therapy and Other Oncological Solutions), is proposed. The spallation process induced by high-energy protons, utilizing various target material, will provide access to a plethora of exotic radionuclides not otherwise accessible with great scientific potential for nuclear physics, astrophysics and fundamental radiochemistry.

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